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MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

THE GEOLOGICAL SOCIETY OF AMERICA¹

THE New York meeting was the largest in the history of the society, the number of fellows and fellows-elect in attendance being 133. The sessions began Thursday afternoon at Columbia University with the business meeting and the reading of memorials and were continued through Friday and Saturday at the American Museum of Natural History. Six titles were added to the printed list, making eighty-six papers in all on the program as offered. On account of the long list of communications, the sessions were held in two sections on Friday and Saturday, but even with this arrangement twenty-nine papers were read by title only, and most of the remainder were read in abbreviated form.

The council accepted the invitation of the University of New Mexico to hold the annual meeting of 1907 at Albuquerque, New Mexico, beginning December 30, 1907. It was felt that a meeting in the west would be of interest and advantage to the society at large, since it would give an opportunity for a general convention of the whole society, the Cordilleran section having intimated its willingness to meet in Albuquerque, if the general society were to meet there.

The society will hold no summer meeting this year, but the fellows have been invited to join with Section E of the American Association for the Advancement of Science in a field meeting near Plattsburgh, N. Y.

¹ Meeting in New York, December 27-29, 1906.

The following is the list of nominations for officers for 1908:

President—Samuel Calvin, Iowa City, Iowa.

First Vice-president—George F. Becker, Washington, D. C.

Second Vice-president—A. C. Lawson, Berkeley, California.

Secretary—Edmund Otis Hovey, New York City.

Treasurer—William Bullock Clark, Baltimore, Md.

Editor—Joseph Stanley-Brown, Cold Spring Harbor, N. Y.

Librarian—H. P. Cushing, Cleveland, Ohio.

Councilors (until 1911)—H. P. Cushing, Cleveland, Ohio, and H. B. Patton, Golden, Colorado.

The following resolutions were adopted in the general session of December 28 at the American Museum of Natural History:

After sixteen years of service as secretary of the Geological Society of America, Professor H. L. Fairchild meets with us at this session for the last time in his official capacity.

These years of his service have witnessed the robust and vigorous growth of this society. To his fidelity, enthusiasm, patience, conservatism and lofty ideals we must ascribe in very large part the virile and promising condition of this society to-day.

The fellows of the Geological Society of America desire to enter on its permanent records this expression of appreciation of such devoted service and this acknowledgment of, and gratitude for, so willing a sacrifice on behalf of the progress of geological science in America.

Since 1891 Dr. I. C. White, now retiring from office, has served as treasurer of this society. For these sixteen years he has given to the management of its finances the benefit of his clear, practical judgment and his experience, and he has so carefully nursed its slender incomes that to-day the treasury of the society presents a most substantial and very gratifying showing.

The fellows of the society desire to record an expression of their appreciation of this watchful, faithful and profitable service.

The program as read was as follows:

Memorial of W. B. Dwight, by F. J. H. Merrill.

Memorial of S. L. Penfield, by J. P. Iddings.

Memorial of I. C. Russell, by Bailey Willis.

Memorial of N. S. Shaler, by J. E. Wolff.

Cutting of the Mississippi and Missouri River Gorges: N. M. FENNEMAN. Read by title.

Lateral Erosion on some Michigan Rivers: MARK S. W. JEFFERSON. Read by title.

Graded Surfaces: F. P. GULLIVER.

The author discussed the processes of aggradation and degradation, and the forms of surfaces produced. Various terms for different forms were considered. Examples of graded surfaces were given from Pennsylvania, New York and New England which show the necessity for greater precision in the use of certain terms, such as terrace, grade-level, base-level, etc.

The New Madrid Earthquake: M. L. FULLER and E. M. SHEPARD. Read by title.

Physiography of the Lower Hudson Valley: J. F. KEMP.

Series of borings across the bottom of the Hudson River in and above the Highlands have recently shown that the bed-rock is unexpectedly deep. Other borings across its tributaries lead to the same conclusion. From these and observations in the field the writer showed a quite profound canyon for the Hudson, which coincides fairly well with the one already known to exist, opposite its mouth and in the continental shelf. The records are used through the courtesy of J. Waldo Smith, C.E., chief engineer of the Board of Water Supply of New York City.

Professor Kemp's paper was discussed by Professors Willis and Davis.

Relations of Physiography to Structure at Manhattan Island and Vicinity: ALEXIS A. JULIEN.

The paper discussed: (1) Palisades of the Hudson; latent minute foliation or flow structure; development of horizontal seams; facility of ice plucking; zone of decay; undercutting of columns; measure

of depth of ice plucking and of age of decayed sheet. (2) Faults at Manhattan; ordinary effects and evidences; system of probable faults in this region; fault blocks on each side of the Hudson gorge. (3) Causes of early divergence of Hudson River into Hackensack Valley, two obstacles; early drainage system over Mesozoic terrane, Manhattan River; later drainage system over the Manhattan region, creeks in fault valleys; successive advances of the Hudson into series of preglacial channel gorges through and around Manhattan Island.

Professor Julien's paper was discussed by Professors Hobbs and Davis.

Geologic Map of North America: BAILEY WILLIS.

Exhibition and description of the map compiled in 1906 for the tenth International Geological Congress.

Professor Willis's paper was discussed by Professors Davis and F. D. Adams.

The Geologic Folio: WILLIAM HERBERT HOBBS.

A discussion of the advantages and disadvantages of the geologic folio as a medium for publication of geologic data.

Professor Hobbs's paper was discussed by Dr. Walcott.

Geological Map of Massachusetts and Rhode Island: B. K. EMERSON.

The map is on the scale of four inches to the mile, presenting with considerable detail the latest results reached in the study of the geology of these states. The author has had access to most of the material gathered by others in the parts of the territory not covered by his own special studies.

Professor Emerson's paper was read by title only, but the map was displayed in the Academy of Science exhibition in the museum.

The Cobalt, Ont., Silver Area: WILLET G. MILLER.

At the Philadelphia meeting of this society two years ago, the writer presented a short paper on the geology of the Temiskaming cobalt-silver area. Since that time the ore deposits of the area have attracted wide attention, not only from the unique character, on this continent, of the ores, but also from their great richness. The present paper contains further details concerning the character and relationship of the veins, and of the rocks. It was illustrated by lantern views, by a model of the more productive part of the area, and by a recently completed map on the scale of 400 feet to an inch with contour intervals of ten feet.

Professor Miller's paper was discussed by Professors Emmons, Bell and Buckley.

Virginia Barite Deposits: THOMAS LEONARD WATSON. Read by title.

Geology of Santa Barbara and Summerland Oil Field, California: RALPH ARNOLD. No abstract received.

Professor Arnold's paper was discussed by Professors Bell and Martin.

Personal Reminiscences of Sir William E. Logan: ROBERT BELL. Read by title.

Memorial of A. R. C. Selwyn: H. M. AMI.

Selwyn was a geologist who attained distinction for his work in Great Britain, Australia and British America. In 1845 he began his researches in England and Wales, in 1853 was appointed director of the Geological Survey of Victoria, Australia, and in 1869 succeeded Sir William E. Logan as director of the Geological Survey of Canada. Volcanic rocks and their relations to the earlier sedimentary formations formed the principal object of his energies in these three portions of the empire, whilst he did much to emphasize the economic relations of these groups to pure geological investi-

gations. In America Selwyn wrought from December, 1869, to January, 1895, a period of twenty-five years. He traversed the continent before the transcontinental lines of railways were built and directed the efforts of his staff to many of the portions of Canada whose resources to-day prove of such remarkable value. He received many distinctions at home and abroad.

Cave-Sandstone Deposits of the Southern Ozarks: A. H. PURDUE.

The rocks exposed within the area treated of in this paper are of Ordovician, Devonian and Carboniferous ages. Near the top of the Ordovician of the area is an unconformity upon which the Upper St. Peter sandstone is put down. Those portions of the sandstone that are put down in basins and cistern-like depressions are frequently preserved from erosion and stand up as conspicuous sandstone masses. Below this horizon, and at different levels in the Ordovician limestone, standing up on the sides of the ravines, are numerous large sandstone masses, similar to those already mentioned. These sometimes occur singly and sometimes collectively, one above the other. For several reasons, which are stated, these are considered to be cave deposits. The sandstone is of the same general character as that constituting the St. Peter, and is supposed to be of the same age. The manner of introduction of the sand and the age of the caverns was considered.

Professor Purdue's paper was discussed by Professors Grabau, Jaggar, Willis, H. C. Hovey, Fuller, Hopkins and Davis.

Volcanoes of Colima, Toluca and Popocatepetl: EDMUND OTIS HOVEY.

The principal object of presenting the paper was to show the society some photographs of these three volcanoes which were taken upon excursions made in connection

with the meeting of the tenth International Geological Congress in the City of Mexico, in September, 1906.

Toluca is the oldest of the three volcanoes. A feature of greatest interest in the crater is the dome of vitreous andesite which welled up in the crater as the latest phase of the activity of the volcano and shows a certain resemblance to the cone of Mt. Pelé. The volcano of Popocatepetl shows its composite character as a strato-volcano with great clearness in the walls of the crater, and streams of lava have been among the features of the most recent eruptions. The volcano of Colima is still sending up a vigorous column of steam from its central summit crater. From this summit crater there poured out, in the latest eruption (1903), streams of very frothy lava which present a strange appearance on account of the porous character of the surface blocks. The same feature characterizes the streams of earlier eruptions and has led some observers to the erroneous conclusion that flows of lava have not occurred at the volcano of Colima.

Current Methods of Observing Volcanic Eruptions: T. A. JAGGAR, JR.

Dana's 'Characteristics of Volcanoes,' based on the Hawaiian Islands, and books with a Vesuvian bias have given undue importance to lava in volcanology. As a result, active volcanoes have recently been interpreted almost invariably as being actuated by a rising lava column as first cause of their explosions. Such interpretation may be correct, but the evidence needs careful sifting in every case, with the alternative possibility in view, namely: (1) That tectonic causes precede magmatic phenomena, (2) that release of superheated steam may be the first cause, (3) that new lava may be a secondary product, and may not appear at all.

Another criticism deserved by all current volcanologic research is that the investigations always follow the event, and are wholly unsystematized. Even the Vesuvian observatory publishes nothing in systematic, tabulated form, and no instrumental records that may lead, eventually, to prediction. Reviewing Pelé, Soufrière, Bandaisan, Tarawera and Krakatoa, all had scientific commissions, and in no case did the commission observe the first eruption or its forerunning phenomena. The writer would point out the exceptional opportunity now possessed by the United States for seismo-volcanologic research.

Professor Jaggar's paper was discussed by Professors Reid and Willis.

Experiments Illustrating Erosion and Sedimentation: T. A. JAGGAR, JR.

The first experiments illustrating rill erosion were made in 1899, and described by Dr. E. Howe and the author (21st Annual Report U. S. G. S.). A coarse spray was used, and the miniature streams of water were an inch or more in breadth, eroding models made of sand, marble dust and coal dust. In 1901 a finer spray was used, produced by a direct jet of water deflected from an inclined and embossed surface. An experiment in 'grand canyon' topography was executed with this apparatus by R. W. Stone. Lateral planation and delta sedimentation were well shown. The latest apparatus consists of a series of atomizers operated by compressed air. Digitate drainage of some delicacy of pattern is etched by the rills on a model made of modeling clay or mill slimes. These rivulets apparently reproduce the mechanism of 'bad land' drainage, or that of a newly uplifted coastal plain. The models made hitherto throw new light on the angle of intersection of streams, on piracy, on parallelism of tributaries and on the general principles which govern the migration

of divides. H. G. Ferguson has assisted in the last experiments.

Characteristics of Various Types of Conglomerates: G. R. MANSFIELD. (Introduced by W. M. Davis.)

The paper gave the results of a critical review undertaken in connection with the study of the Roxbury (Boston) conglomerate; examining the descriptions of conglomerates of many ages and countries as to the conditions of their formation.

Mr. Mansfield's paper was discussed by Professors Grabau, Barrell, Miller, C. W. Brown and Davis.

Dome Structure in Conglomerate: RALPH ARNOLD. Abstract not received.

River Sediment as a Factor in Applied Geology: W J MCGEE.

Various recent events and movements render it clear that the sediments transported by rivers require consideration, not merely as a factor in geologic process, but as an industrial factor of much moment. In systematic geology it commonly suffices to deal simply with the stream as a vehicle transporting load in solution, in suspension, and rolled or pushed along the bottom; while in most industrial problems the stream itself is regarded as the primary agency, and the load is commonly neglected, save merely as a disturbing factor. Yet in that constantly increasing control of streams (as sources of power, as supplies of water for irrigation and other purposes, as canals for transportation, etc.) which must eventually result in the complete artificialization of river systems, the load either immediately or remotely governs the character and behavior and ultimate utility of the stream. The bearing of these considerations on such engineering works as those of the lower Mississippi region and on such projects as that of the proposed Lakes-to-Gulf Waterway, is particularly worthy of discussion.

Relations between Climate and River Deposits: JOSEPH BARRELL.

The nature of subaerial river deposits is controlled by the geographic and climatic conditions of origin. The importance of the climatic factor is appreciated by contrasting the nature of deposits accumulating under similar geographic but dissimilar climatic conditions. As a result, where an ancient sedimentary deposit can be shown to be of subaerial origin, if the geographic conditions existing at the time can be allowed for, the climatic conditions of origin may be determinable. To that end, the geographic and climatic influences upon river sediments are examined under three headings: (1) relation of sediments to regions of erosion, (2) effects of transportation, (3) relation of sediments to regions of deposition. Under the latter heading the character of the surface of deposition is considered, and finally the relations of the deposits to four kinds of climates, namely, constantly rainy, intermittently rainy, subarid and arid. The effects of climatic changes upon sedimentation are also considered, and it is concluded that climatic as well as tectonic hypotheses must be considered in interpreting the cause of sedimentary variations.

Continental Origin of the Mauch Chunk Shale: JOSEPH BARRELL.

The discussion of the previous paper allows the presentation of the facts and conclusions of the present one. The Mauch Chunk Shale and the Pocono Sandstone represent the Mississippian, or sub-Carboniferous, in Pennsylvania. The former, consisting of red shales and sandstones, is considered in detail. After a statement of the relations to the underlying and overlying formations the lithologic and structural characters and the nature of the life record are stated. The problem of origin is then discussed, and it is concluded that

within the limits of the anthracite coal fields the entire formation originated as flood-plain deposits on the subaerial surface of a large delta. The climate under which the formation accumulated is next considered, and it is inferred that it was of a subarid character. The long continuance of similar conditions through the Upper Devonian is then indicated, and emphasized by contrast with the opposite character of the coal measures. In this connection, the possible importance of subarid climates upon the evolution of amphibians is suggested.

Professor Barrell's two papers were discussed by Professors David White, Willis, Huntington, Grabau and Davis.

Origin of Ocean Basins in the Light of the New Seismology: WILLIAM HERBERT HOBBS.

A review of the arguments upon which the permanence of the ocean basins has been assumed, with the modifications in them which time has wrought; particularly, however, as a consequence of zoo-geographic, comparative geologic and structural studies. The 'distant' study of earthquakes has shown that they are fifteen to twenty-fold as numerous as formerly supposed, and that over ninety per cent. occur upon the floor of the seas, and appear to proceed from the scarps bordering the great ocean deeps. The data for elevation or depression available within the coral seas have been assembled, and differential vertical movement is thus shown to have been recently the greatest within the zones of earthquakes, as mapped by de Montessus.

Hypothesis of Continental Structure: BAILEY WILLIS. No abstract received.

Mr. Willis's paper was discussed by Professors Heilprin, Schuchert, Emerson and F. E. Wright.

The Limestone Ocean of pre-Cambrian Time: REGINALD A. DALY. Read by title.

Controlling Factors of Artesian Flow: M. L. FULLER.

The rapid extension of well-drilling in granites, schists, slates, etc., in the last few years, and the obtaining in them of true artesian flows at many points, together with the increasing development of wells from uniform unconfined horizontal sands, has made a revision of the commonly accepted 'requisites' of flowing wells desirable. The paper discusses the character of the reservoirs, the sources of water, the confining agents, and the source of pressure, and concludes that the requisites of artesian flows are only three in number: (1) an adequate source of water supply; (2) a retaining agent offering more resistance to the passage of water than the well or other outlet, and (3) an adequate source of pressure. The specific sources of water and head, and the specific character of confining agents are too variable to warrant inclusion in standard requisites.

Conditions of Circulation at the Sea Mills of Cephalonia: M. L. FULLER.

Near Argostoli, on the southern coast of the island of Cephalonia, in Greece, a number of streams have, for an unknown period of time, left the sea and, flowing inland with a volume sufficient to operate two sea mills, finally disappeared in a fissured limestone. To account for the continuous circulation under conditions which preclude any lower outlet, the action of interior heat on an unsymmetrical passage with a short 'inlet' and a long 'outlet' arm was postulated by F. W. and W. O. Crosby. In the longer arm, because of its greater exposure to heat, the water is supposed to be warmer and lighter than in the short arm, thus establishing the necessary conditions for

circulation. A difference of 20 degrees in the average temperature, which may be supposed to occur with a system reaching a depth of 2,000 feet, would give an excess of height amounting to 10.6 feet to the warmer over the colder arm. The writer believes a difference of density (independent of temperature) in the water of the two arms affords a simpler and more effective explanation of the circulation. If the water remained unchanged in composition it would rise in the outlet arm of the passage only to the level of its entrance; but if it became diluted by an admixture of fresh water, the column in the outlet would be higher than in the inlet arm, and the essentials for circulation would be established. The specific gravity of Mediterranean waters is 1.03, hence a column of the sea water 100 feet in length will support a column of fresh water 103 feet high, or of sea water diluted one half by fresh water, a column 101½ feet in height. A depth of 2,000 feet with 50 per cent. dilution would furnish a working head of thirty feet as compared with ten feet under the heat hypothesis, while a head of three fourths of a foot, or enough to establish circulation, would be produced under the same dilution at a depth of fifty feet, or entirely within the zone controlled by atmospheric temperatures.

Mr. Fuller's two papers were discussed by Professors Kemp and Davis.

Normal Pressure Faulting in the Allegheny Plateaus: GEORGE H. ASHLEY. Read by title.

Geological Structure of the Uinta Mountains: S. F. EMMONS.

The Uinta Mountains form a range unique in the Cordilleran system, in that its axis of uplift has an east-west direction, and that it has a typical anticlinal structure. The conditions under which the

range was studied by the fortieth parallel and the Powell surveys in 1869-74 were reviewed and the reasons given why those studies were necessarily incomplete. After referring to articles on separate parts of the range by J. D. Irving (1896) and Chas. P. Berkey (1905), the writer gave the conclusions he has been able to arrive at with regard to its structure, and the age of the older beds involved in the anticlinal fold; together with some remarks on a new type of topographic relief, as the result of field studies made by him in company with Mr. F. B. Weeks, during the summer of 1906.

Stratigraphy and Structure of the Uinta Mountains: F. B. WEEKS. Read by title.

Structure of the Franklin Mountains, Texas: G. B. RICHARDSON. (Introduced by C. W. Hayes.)

The Franklin Mountains are the southern extremity of the long narrow range, known locally by different names, that extends southward from the Rocky Mountains, east of the Rio Grande, as far as El Paso. They are composed of sedimentary and igneous rocks which range in age from pre-Cambrian to Cretaceous. The strata dip westward from 20 to 75 degrees, and the mountains as a whole have the appearance of a block of the Basin Range type. The distribution of the strata shows that the range is traversed by a complex system of faults. Detailed sections of this uncommon structure were given.

Probable Age of the Meguma (Gold-bearing) Series of Nova Scotia: J. E. WOODMAN. Read by title.

Artificial Production of Gneissic Structures by Crystallization under Stress: FRED. EUGENE WRIGHT.

The generally accepted theory of the formation of gneissic and schistose structures, as it has been developed, especially by Van Hise, F. Becke and others, postu-

lates stress as a fundamental factor controlling the direction of crystal growth. Experiments with silicate glasses of diopside, wollastonite and other prismatic or tabular minerals, carried out in the geophysical laboratory of the Carnegie Institute, have shown that crystallization can be made to proceed in the glasses at a temperature much below the melting point of the individual minerals, and while the glass is still in a highly viscous state and capable of sustaining a considerable amount of applied mechanical stress. Glasses of these minerals were thus crystallized under stresses acting either in one direction or in two directions normal to each other, and a parallel arrangement of the prismatic crystals along definite planes or lines produced similar to that which characterize gneisses and schists. More recent experiments have also been performed with a view of obtaining a more definite idea of the order of magnitude of pressure necessary to influence and control the direction of crystal growth in such aggregates, and will be described briefly.

Origin of Meteor Crater (Coon Butte), Arizona: H. L. FAIRCHILD.

Four years of exploration and deep boring in and about the famous crateriform basin in Arizona have revealed interesting facts tending to establish the 'meteor theory' of its origin.

The Afton Craters: W. T. LEE.

Two depressions, locally known as the Afton craters, occur in southern New Mexico, west of the Rio Grande, in the midst of a broad sand plain which represents the aggraded floor of the ancient Rio Grande. The craters are comparable in size and character with 'Coon Butte' and the crater of Zuñi Salt Lake. They differ notably from ordinary volcanic craters, but are situated in a region of recent volcanic ac-

tion and are closely associated with crater cones of the ordinary type.

The geology of the surrounding regions indicates that the craters may be underlain by beds of salt, gypsum and limestone, the removal of which, by solution, may in part account for the depressions. The crater rims, however, composed of the material of the plain commingled with volcanic cinders, yield unmistakable evidences of explosive action, from which the inference is drawn that the craters are probably best explained as due to explosions of steam or other volcanic gases.

Volcanic Necks of the Mt. Taylor Region, New Mexico: D. W. JOHNSON. (Introduced by W. M. Davis.)

Some doubt has been expressed as to the correctness of interpreting as volcanic necks certain buttes which show vertical columnar structure, and which are surrounded at lower levels by undisturbed sedimentary beds. The Devil's Tower, of Wyoming, has been referred to a laccolithic origin, in part at least, because it shows the features mentioned, and the interpretation of buttes of the Mt. Taylor region as necks has been questioned. The paper presents evidence to show that the buttes of the Mt. Taylor region are undoubted volcanic necks, surrounded by undisturbed sediments, and exhibiting vertical columnar structure in many cases. The general history of the vulcanism and erosion of the region is considered, and the structural details of the neck discussed.

Earth-flows at the Time of the San Francisco Earthquake: ROBERT ANDERSON. (Introduced by Ralph Arnold.)

This paper treats of a variety of landslides caused by the concentration of water at certain points near the surface of gentle or steep slopes. Earth-flows are defined as slides or flows of portions of the surface of

slopes where the surface material has been saturated, loosened and weighted down and caused to cave away and flow or creep as a semi-fluid mass. They are distinguished from *avalanches* or comparatively dry landslides of otherwise loosened material. A number of instances are described and emphasis is given to their importance as initial factors in the formation of drainage lines.

Radio-activity of the Thermal Waters of Yellowstone National Park: HERMAN SCHLUNDT and RICHARD B. MOORE. (Introduced by C. W. Hayes.) No abstract received.

A Lower Huronian Ice Age: A. P. COLEMAN.

Since the final proof of the Permian glacial period of India, Australia and South Africa, more attention is being paid to the evidences of still more ancient glaciations, *e. g.*, in Cambrian times. For years the writer has believed that the 'slate conglomerate' at the base of the Lower Huronian of Canada is glacial, since it contains angular and subangular boulders of all sizes up to cubic yards, enclosed in an unstratified matrix. These boulders are often miles from any possible source. Recently, striated stones have been broken out of their matrix in the Lower Huronian of the Cobalt silver region, giving still stronger proofs that the formation is an ancient boulder clay. The results of this investigation have an important bearing on the earth's early history, since the Lower Huronian has only one known formation before it, the Keewatin. The earth's internal heat was not sufficient at that time to prevent the formation of an ice sheet in latitude 46 degrees.

Professor Coleman's paper was discussed by Professors Miller, Salisbury, Lane, Bell and Clapp.

Glaciation of Manhattan Island, New York:

ALEXIS A. JULIEN. Read by title.

Glacial Erosion in the Northfiord: MARK

S. W. JEFFERSON. Read by title.

Recent Changes in the Glaciers of Glacier Bay, Alaska: F. E. and C. W. WRIGHT.

A general geologic reconnoissance of Glacier Bay, Alaska, was made by the writers, assisted by Mr. R. W. Pumpelly, during the past summer. In the course of their investigations the existing glaciers were remapped and studied with special reference to the changes which have taken place since 1891, when a careful topographical survey was made of them by Dr. H. Fielding Reid. It was found that, in general, recession and melting on a remarkable scale have prevailed, although local advance was observed at several points. Comparative photographs were presented showing these changes and the causes were discussed which have probably been active in producing such effects. Incidentally, several phases of glacial sculpture were briefly described, also a new photo-topographic method which was applied to this region and found well adapted to work of such character.

Professor Wright's paper was discussed by Professors Blake, Reid, Gulliver and G. F. Wright.

Recent Changes in the Malaspina and other Glaciers of the Yakutat Bay Region, Alaska: RALPH S. TARR.

In the interval between September, 1905, and June, 1906, the eastern (Marvine) lobe of the Malaspina glacier and several smaller glaciers in the Yakutat Bay region have advanced so rapidly as to break the ice into a sea of crevasses. Glaciers which were easily traversed in 1905 are now practically impassable. This paper describes these changes, shows comparative illustrations of the conditions in the two seasons, discusses

the phenomena associated with the change, proves that the forward movement is still in progress, and discusses the cause of this remarkable change, suggesting its relation to the vigorous earthquake action.

Professor Tarr's paper was discussed by Professors Jaggar, Reid and Brooks.

The Glacier of the Lebanon Mountains: G. FREDERICK WRIGHT.

In the autumn of 1905, in company with Professor A. E. Day, of the Syrian Protestant College of Beirut, the author took a horseback excursion of several days, leading diagonally from Beirut to the cedars of Lebanon. The results of his observations were to demonstrate, from the lack of glacial phenomena, and from the character of eroded surface, that there had been no general glaciation of these mountains. But it was clearly evident that a single glacier had extended from the highest summit of the range (10,000 feet above the sea) five or six miles down the valley of the Kadisha River, and lingered long enough to build up a terminal moraine three miles wide and four miles long and one thousand feet in thickness. Upon the surface of the upper end of this moraine the famous grove of the cedars of Lebanon is now to be found. Many subsidiary observations were recorded in correction of erroneous views which have been entertained.

Professor Wright's paper was discussed by Dr. H. C. Hovey and Professor G. F. Wright.

Ice Present during the Formation of Glacial Terraces: F. P. GULLIVER.

This paper described with maps and lantern slides some glacial deposits along the Connecticut, Thames and Quinnebaug rivers, which have usually been classed with the terraces formed by the down-cutting of the rivers. An example of terraces which have surely been carved by river action is found on the Westfield river

west of Springfield, Mass. The deposits described along the Connecticut rivers were contrasted with those found at Westfield, and it was shown that they must have been formed before the ice had completely melted from the valleys. These deposits were therefore forms of aggradation and not forms produced by degradation. Typical eskers, deltas and kettle-holes are associated with these so-called terraces; and even where these deposits have the characteristic form of river-cut terraces, cross sections as revealed by railway or other cuts show delta structure rather than the structure of alluvial flood plains. The delta lobes point either down stream or into side valleys, and there are frequently found unfilled portions of the main pre-glacial valley and of its tributaries, below the level of the delta-terrace, between the delta-terrace and the rock walls of the older valley.

Dr. Gulliver's paper was discussed by Professors Clapp, Salisbury, Leverett and Alden.

Discovery of Cambrian Rocks in South-eastern California: N. H. DARTON. Read by title.

Limestones of Westchester and Putnam Counties, New York: CHARLES P. BERKEY.

In the course of detailed areal mapping of the Tarrytown and West Point quadrangles, opportunity has been offered for extensive study of the variations and comparisons of the relationships of the formations characteristic of the Highlands region of New York. Certain constants of relation and character together with the causes for occasional variability and abnormal occurrences were discussed in this paper, and their bearing upon further stratigraphic and structural work suggested.

The Galena Series: FREDERICK W. SARDESON.

The so-called Trenton and the Galena formations of the Galena series in Wisconsin, Illinois, Iowa and Minnesota were discussed in regard to their present and original wide extent and uniform thickness. The lithologic diversity and the faunally uniform condition of the parts of the series were briefly considered. The relation which the naming of these formations has borne to the formational uniformity was outlined. The value of the Beloit formation as a geologic unit was followed by a like discussion of the Platteville limestone, leading to the question of expediency in using lithologic, as against paleontologic, evidence, as the basis for geologic formational units, in regard to the Galena series in particular, and somewhat as to formations in general.

Age and Stratigraphic Relations of the Chattanooga Black Shale: AMADEUS W. GRABAU.

Recent studies made of the principal sections of the Black Shale in the southern Appalachians have convinced the author that the reported hiatus between the Black Shale and the overlying formations does not exist, and that hence the age of the shale needs to be reconsidered. The facts bearing on this problem, together with an outline of the corresponding paleogeographic conditions of eastern United States as interpreted by the author, were presented.

The Medina Sandstone Problem: AMADEUS W. GRABAU.

Following up the line of investigation which led the author, at the Philadelphia meeting of the society, to announce his conclusions that the Oneida conglomerate is of late Medina age, and the Shawangunk conglomerate is of Salina age (since confirmed by the finding by the New York Survey of a Salina fauna in this conglomerate), the present communication deals more especially with the mode of formation of these sandstones and conglomerates.

The structural and stratigraphic evidence, pointing to a continental origin (river and æolian) of portions of these sandstones were given, and further evidence presented which seems to indicate that part of the accumulation of these sands began in Ordovician time.

Paleogeography of the American Devonian:

CHARLES SCHUCHERT.

A series of lantern slides was shown, illustrating the relation of the seas and lands of Helderbergian, Oriskanian, Onondaga, Hamilton and Chemung times.

Carboniferous of the Appalachian Basin:

JOHN J. STEVENSON. Read by title.

Coal Measures and Higher Beds of South Brazil: I. C. WHITE.

The author showed that a great system of rocks (the Santa Catharina system) exists in South Brazil, covering large areas in the states of Rio Grande do Sul, Santa Catharina, Parana and S. Paulo, entirely comparable to the Karroo system of South Africa. Also that, like South Africa, Brazil had its Glacial epoch succeeding the deposition of the Coal Measures, the 'Dwyka' and 'Talchir' conglomerates of Africa and India being paralleled by the Orleans conglomerate of South Brazil; that the Brazilian Coal Measure flora, as described by Mr. David White, is the same as that of the Coal Measures in South Africa, India and other southern regions during Permian time, and also that the reptilian fauna, as described by Dr. J. H. McGregor and Dr. A. Smith Woodward, is the same as that characterizing the South African beds. In other words, that the 'Gondwanaland' of the Indian geologists not only extended into Africa, but crossing from the latter into South America, most probably encircled in a broad belt the entire southern hemisphere.

Permo-carboniferous Climatic Changes in Brazilian South America, as indicated by Fossil Plants: DAVID WHITE.

The paper presented the conclusions, drawn from a study of the fossil plants, respecting Permo-carboniferous glaciation in Brazil, subsequent Permian climatic changes, and probable geographic relations of the southern portion of the continent, both to the Indo-Africo-Australian 'Gondwana Land' and to the northern land masses.

Structure of the Deep River Triassic: COLLIER COBB. Read by title.

Red Beds of Oklahoma and Adjacent States: CHARLES NEWTON GOULD. Read by title.

Stratigraphic Relations in Central Wyoming: N. H. DARTON. Read by title.

Correlation of the Triassic Trap Rocks of New Jersey: J. VOLNEY LEWIS. Read by title.

Pleistocene Glacial Phenomena of the Bolivian Plateau: W. G. TIGHT.

The paper described the topography and glacial deposits in the vicinity of La Paz, and the Cordillera Real east of the Lake Titicaca basin, and established the fact that in Quaternary times the Bolivian plateau region was subjected to three distinct stages of glaciation with well-marked interglacial periods. The paper also described the characters of the great basin south of the lake Titicaca region which was the floor of a very extensive glacial lake. The old beaches occur in three sets which are correlated with the three stages of glaciation of the plateau.

Preglacial Drainage in the Mississippi Valley, A Working Hypothesis: W. G. TIGHT.

The hypothesis proposes that the present Mississippi, Ohio and Missouri drainage

systems are of early Quaternary origin. That prior to the first ice invasion of the Quaternary the whole upper Mississippi drainage was to the north into the Hudson Bay. The movement of the ice into this basin advanced upon a rising plane. The margin of the ice was generally uniform and attenuated. The impounding of the drainage waters resulted in extensive frontal lakes. Sluggish action of the ice and poorly developed moraines, extensive sheets of extra morainic drift, slow movement of the waters from the ice front with deposition of loess and with general aggradation along the stream courses, the modification of preglacial topography and profound changes in drainage were some of the resultants. A new outlet to the south along the line of the present Mississippi over a low col between the southern end of the Appalachians and the Ozarks, was established and the general plan of the present drainage lines of the Mississippi basin developed. The later ice invasion of the Quaternary into the basin followed the establishment of gradients and developed the general lobate form of the margin characteristic of these invasions and produced only local and minor frontal lake phenomena south of the continental divide which was later discovered by the recession of the ice. The development of strong lobate moraines, the distribution of but a small amount of extra morainic drift, and the vigorous action of the streams discharging from the later ice fronts, were characteristic phenomena. The paper recited some of the evidence in support of the hypothesis and asked for more careful observation of the phenomena upon which data must be collected to prove or disprove the hypothesis.

Professor Tight's paper was discussed by Messrs. Leverett and Carney.

Glacial Flowage over New England: J. B. WOODWORTH. Read by title.

Quaternary Changes of Level in New England: FREDERICK G. CLAPP. No abstract received.

Mr. Clapp's paper was discussed by Professors Leverett, Hitchcock, Alden and Ami.

Glacial Lake Memphremagog: C. H. HITCHCOCK.

The existence of this lake was pointed out at the meeting of the Geological Society of America in 1894 (*Bull. Geol. Soc. Am.*, Vol. 6). Recent studies show that it was tributary to Glacial Lake Champlain by way of both the La Moille and Winooki valleys. When the ice filled the Champlain valley to the depth of a thousand feet, the impounded water upon the east side could have reached the Connecticut valley by way of White River.

Professor Hitchcock's paper was discussed by Professors G. F. Wright and Richardson.

Pre-Wisconsin Drift in the Finger Lake Region of New York: FRANK CARNEY. No abstract received. (Introduced by H. L. Fairchild.)

Mr. Carney's paper was discussed by Professors Tarr, Clapp and Leverett.

Wave-cut Terraces in Keuka Valley Older than the Recession Stage of Wisconsin Ice: FRANK CARNEY. No abstract received. (Introduced by H. L. Fairchild.)

Mr. Carney's paper was discussed by Professor Clapp.

Deposits of Glacial Age in the Non-glaciated regions of Central Asia: ELLSWORTH HUNTINGTON.

Different rates of weathering, and consequently of erosion and deposition, during glacial as opposed to inter-glacial epochs in arid regions appear to cause the alternate deposition and erosion of gravel beds

in the bottoms of all the valleys, whether connected with glaciers or not. The process gives rise to a series of terraces, uniform over wide areas. Such terraces have often, and probably wrongly, been interpreted as evidence of earth movements. In the self-contained basins of Central Asia glacial epochs were characterized by enlarged lakes in which greenish clays were deposited; inter-glacial epochs by diminished lakes and by the deposition of reddish, subaerial strata upon the previous lacustrine clays. A study of such alternating lacustrine and subaerial deposits in three widely separated regions leads to the conclusion that the glacial period consisted of an *increasingly* severe series of climatic oscillations preceding the well-known *decreasingly* severe series. Coal and iron ore occur interbedded with lake deposits. This suggests that some of the coal beds of more ancient times may indicate rapid changes of climate such as those of the Pleistocene and Permian glacial periods.

Some Results from the Study of the Cambrian Brachiopoda: CHAS. D. WALCOTT. Read by title.

Cryptozoon: Genera, Species, Relationships: HENRY M. SEELY. Read by title.

Crustacean Fauna of the Shawangunk Grit in Eastern New York: JOHN M. CLARKE. Read by title.

Additional Footprints from the Carboniferous Shales of Massachusetts: J. B. WOODWORTH. Read by title.

Occurrence of Unusually Large Calcite Crystals in New York State: D. H. NEWLAND. Read by title.

Origin of the Lead and Zinc Ores in Missouri: E. R. BUCKLEY. No abstract received.

Professor Buckley's paper was discussed by Drs. H. C. Hovey and Ami.

Asymmetric Differentiation in a Syenite Batholith: H. P. CUSHING.

This syenite occurs in the mid-Adirondack region, occupying some 100 square miles of surface. The normal rock is a highly feldspathic one, with about sixty-three per cent. of silica. It is one of the great pre-Cambrian intrusives of the region, of later date than the Grenville sediments, and the Laurentian granite gneiss. It shows contacts against anorthosite and Grenville calcareous sediments on one side, when it becomes basic, with a high content of ferro-magnesian minerals; on another side it cuts Laurentian granite gneisses and becomes acidic, approaching a granite in character and composition. In this granite portion is a considerable anorthosite inclusion, surrounded by basic syenite, which grades into the normal acid variety. The relations seem to point to incorporation and assimilation of the adjacent rocks as the cause of the asymmetry of the batholith. Intermediate rocks, such as anorthosite soaked with syenite, are also found.

Professor Cushing's paper was discussed by Dr. Lane.

Formation of Leucite in Igneous Rocks: HENRY S. WASHINGTON. Read by title.

Genetic Connections of Some Granitic Dikes: ALFRED C. LANE.

Near Huron Mountain, Marquette County, the hornblende gneisses and schists are cut by series of red granitic dikes. The coarser pegmatitic ones cut the finer, and may be regarded as products of the same magma when the country rock had been heated up and the magma cooled.

Different Manifestations of the Ophitic Texture: ALFRED C. LANE.

The ophitic texture results when idiomorphic feldspar is embedded in augite crystals. These in their growth crowd before them corroded remnants of olivine,

etc. Specimens were shown illustrating the mottled effect which this texture gives to the rock under various conditions, from those of the 'lustrermottled melaphyre' to those of the 'varioloïd greenstone.' The origin of the mottling is partly the ready alteration of the olivine, partly the porosity between the augite crystals. This latter character may be rather characteristic of the effusives.

Occurrence of Diamonds in North America: GEORGE F. KUNZ. Read by title.

*Silver-gold Ores at San Pedro de Guana-
cevi, Durango, Mex.:* FREDERICK B.
PECK. No abstract received.

*Perspective View of the Submarine Canyon
of the Hudson River:* J. W. SPENCER.
Read by title. (Read before Section E,
American Association for the Advance-
ment of Science, December 31.)

*Titaniferous Basalts of the Western Medi-
terranean.* H. S. WASHINGTON. Read
by title.

The Paleozoic Section of the Upper Yukon:
A. H. BROOKS and E. M. KINDLE. Read
by title.

*Stratigraphic Succession North of Cook In-
let, Alaska:* SIDNEY PAIGE and ADOLPH
KNOPP. (Introduced by A. H. Brooks.)
Read by title.

*Seismological Observations in the United
States:* H. F. REID. Read by title.

*Peale's Painting of the Exhuming of the
First American Mastodon:* ARTHUR BIB-
BINS. Read by title. (Read before Sec-
tion E, American Association for the
Advancement of Science, December 31.)

*Relations of the Ithaca and Chemung
Faunas of Western Maryland:* C. K.
SWARTZ. Read by title.

EDMUND OTIS HOVEY.

ZOOLOGY AT THE NEW YORK MEETING II.

*The Order of Appearance of the Ambu-
lacrall Appendages in Holothuria flori-
dana Pourtalès:*¹ CHARLES L. EDWARDS.

Tentacles.—During the fourth day the embryo has a primitive symmetry of four tentacles; one placed in the mid dorsal interradius arising from the left dorsal radial canal, one in the right dorsal interradius from the right ventral radial canal, one in the right ventral interradius from the mid ventral radial canal and one in the left dorsal interradius from the left ventral radial canal. During the fifth and last day within the vitelline membrane, the embryo buds a fifth tentacle into the left ventral interradius from the mid ventral radial canal. In this condition the Holothurid hatches during the sixth day but it is not until the eighth day that the fifth tentacle has grown to the size of the four primitive tentacles. On the fortieth day a sixth tentacle develops in the right ventral interradius from the right ventral radial canal. From the forty-second to the forty-fifth days the next three tentacles appear; the seventh, in the left ventral interradius, from the left ventral radial canal, the eighth, in the mid dorsal interradius from the right dorsal radial canal and the ninth, in either the right or left dorsal interradius, from the right or left dorsal radial canal, respectively. On the fifty-third day the tenth tentacle appears in the dorsal interradius opposite to that in which the ninth has developed. On the seventy-fifth day the eleventh tentacle appears in the mid dorsal interradius.

Pedicels and Papillæ.—The first pedicel has budded from the posterior end of the

¹ Formerly identified as *Mülleria agassizii* Sel. —Edwards, C. L., 'Notes on the Embryology of *Mülleria Agassizii* Sel., a Holothurian common at Green Turtle Cay, Bahamas,' Johns Hopkins Univ. Circ., 1889, Vol. VIII., p. 37.

mid ventral radial canal on the fourth day and, after hatching on the sixth day, develops a sucker. On the ninth day a second pedicel arises to the left from the mid ventral radius. Only two pedicels are found until the twenty-second day when a third appears also to the left of the mid ventral radius. On the twenty-fourth day buds of the first pair of papillæ ventrad from the anterior ends of the dorsal radii inaugurate the bilateral symmetry later shown in the appendages. On the thirtieth day the fourth pedicel, *again to the left*, arises from the mid ventral radius and also one bud ventrad from both right and left ventral radii. Not until the fortieth day does the first pedicel arise to the right from the mid ventral radius. On the fifty-third day the second pair of papillæ arises ventrad from toward the posterior ends of the dorsal radii. At this time twenty pedicels and nineteen buds have appeared from the ventral radii and nine papillæ and twenty-seven buds from the dorsal. The seventy-fifth day in my series from the embryos presents the largest number of appendages, forty developed and forty-five buds. Four of the smallest adults from my statistical series have 77, 99, 141 and 150 appendages and twenty, the adult number, of tentacles.

Some Further Points in the Development of Ophiothrix fragilis: E. W. MACBRIDE, M.A., F.R.S., McGill University.

In December, 1903, the author read a paper at the Philadelphia meeting of the American zoologists on the early stages in the development of the British ophiuroid, *Ophiothrix fragilis*. Since that time he has been continuously engaged in working out the development completely and hopes to be able to publish an exhaustive account of it this summer. Meanwhile some interesting points have transpired. In the former paper on the subject the segmenta-

tion was described as leading to the formation of a morula. An invagination on one side gave origin to the archenteron, the invaginated cells not forming a simple vesicle but a sac with a solid tongue projecting from one side of it. From the apex of the archenteron the coelom arose as a vesicle, and the embryo became triangular in shape—one point being posterior and the two others the rudiments of the first arms of the ophiopluteus larva. The interior cells of the morula gave rise to the mesenchyme from which the skeleton of these arms was developed. A subsequent visit to Plymouth and renewed experiments in artificial fertilization led to the unexpected result that the type of development previously described was that of eggs which were not quite ripe. When a male and female were enclosed in a glass jar and allowed to spawn naturally the segmentation of the egg led to the formation of a hollow blastula one side of which became thickened and gave rise to mesenchyme. Regular invagination followed giving rise to a normal archenteron entirely devoid of any such tongue as was described above, the coelom arose as a thin-walled vesicle which became completely separated from the archenteron before dividing into right and left halves. At the opposite pole of the larva to the blastopore there was developed a great crest of vacuolated cells, probably an apparatus to assist in flotation. This crest disappeared as the first two arms of the larva became larger. It follows, then, that it is not a certain test of the ripeness of an egg that it can be fertilized, and that a small change in the chemical condition of the egg can effect a great change in the subsequent development.

The later development of the larva is interesting on account of the history of the coelom. This becomes divided on both left and right sides into anterior and posterior

halves. Then later from the posterior end of the anterior half on each side a vesicle grows out. These vesicles are the left and right hydrocoeles. The latter though rudimentary in the adult is at first just as large as the left one which gives rise to the water-vascular system. The right hydrocoele in Asteroidea and Echinoidea has from the first a position near the mid dorsal line, on which account some have doubted its homology with the left hydrocoele. But there can be no doubt of its homology in *Ophiothrix fragilis* where it is not only normal in position but sometimes assumes a five-lobed form similar to that of the left hydrocoele. Its dorsal position near the primary water-pore in Asteroidea and Echinoidea is accounted for by the fact that in these groups it is oriented not with respect to the larval mouth but with respect to the permanent mouth which is on the left of the larva. In Ophiuroidea, where the larval mouth persists as the adult mouth, it is accordingly found unmistakably on the right side. Subsequently the preponderant growth of the left hydrocoele and all the structures associated with it carries the water pore dorsal to the mouth over to the right side where it comes to lie near the right hydrocoele, a position which it occupies from the beginning in Asteroidea and Echinoidea.

Exhibition of Embryos of the Japanese Frilled Shark, Chlamydoselachus anguineus, with Comments upon its Plan of Development: BASHFORD DEAN, Columbia University.

Mercator Projections of Vertebrate and Arthropod Embryos: WILLIAM PATTEN, Dartmouth College.

The Pre-placental Development in Geomys bursarius: THOMAS G. LEE, University of Minnesota.

This investigation is a continuation of the writer's comparative studies upon the

earliest stages of development in North American Rodentia.

Geomys bursarius, or the 'pocket gopher' as it is commonly called, is characterized by the so-called inversion of the layers which is of a much simpler type than that found in other rodents, as the mouse and guinea-pig.

Development takes place entirely outside of the uterine cavity in a decidual cavity formed by the vascularization and breaking down of the ventral uterine connective tissue. The didermic blastocyst perforates the epithelium lining the ventral portion of the uterine cavity. This perforation is relatively large and does not become closed as in the guinea-pig or in man, but remains open for a considerable period. The epithelial lip of this rounded opening becomes somewhat thickened and everted.

The trophoblast, in a zone a little way external to the germinal area, becomes adherent to the outer margins of this epithelial lip, thus suspending the blastocyst while the decidual cavity is being hollowed out beneath it in the connective tissue.

Rauber's layer disappears from the surface of the germinal area at about the time of perforation. The entoderm forms a well-marked vesicle or yolk-sac which rapidly increases in size and which becomes invaginated on its dorsal surface by the sinking in of the germinal area, thus bringing about the so-called inversion of layers.

The amnion is formed by the folding over and fusion of the outer margins of the germinal area from all sides, while the outer portion of these folds, composed of trophoblast, form a membrane constituting the serosa or false amnion. This serosa now closes the opening through the uterine epithelium above referred to.

At a later period, secondary folds of the serosa appear which unite forming a two-layered cup or vesicle of trophoblastic

tissue, the cavity of which disappears by the proliferation of the cells, and this rounded plate of trophoblast which now constitutes the foetal portion of the true placenta is brought into contact with the epithelium of the dorsal portion of the uterine cavity, giving rise to the true placenta.

Into the ventral surface of this trophoblastic plate extends the vascular mesoderm to complete the allantoic portion of the placenta.

While these changes are taking place, the embryo has been rapidly developing, nourished by a highly developed yolk-sac placenta which ceases to be functional after the completion of the true dorsal placenta.

The Maturation of the Mouse Egg: W. R. COE and W. B. KIRKHAM.

The process of maturation and fertilization in a mammalian egg was first described in detail by Sobotta in 1895. His work was with the mouse egg, and he recorded the formation of more than one polar body in only one tenth of these eggs. Gerlach, after a study of preparations made as early as 1890, has recently revived Tafani's theory that in the majority of mouse eggs the second polar body is suppressed. Gerlach's conclusion is that when a spermatozoon enters an egg some time after it has formed the second polar spindle, the second polar body fails to develop, the spindle degenerating within the egg. These observations differ not only from almost all those previously made upon other eggs, but also from the conclusions since arrived at by Van der Stricht, Heape and Rubaschkin, for the eggs of the bat, rabbit and guinea-pig, respectively, who all agree that two polar bodies are regularly formed by every ripe egg.

Careful study of numerous series of sections of eggs and ovaries of the white

mouse have led to the following conclusions:

1. Two polar bodies are apparently formed by every egg which is capable of development, the first polar body appearing within the ovary, the second after the entrance of the spermatozoon into the egg.

2. At the end of the spireme the number of chromatin masses is between twelve and twenty-four.

3. Twelve masses of chromatin are cast out with the first polar body, and a like number remain in the egg.

4. There is a sharp distinction in form between the chromosomes of the first and those of the second polar spindle.

5. Every egg which we have seen in the Fallopian tube before fertilization possessed a second polar spindle.

6. The zona pellucida, which is quite distinct, may persist undiminished through the early cleavage stages; but in most cases the first polar body escapes from it during the process of ovulation, so that the majority of eggs after fertilization possess the second polar body only.

7. During the spring months ovulation commonly occurs every twenty-one days, independent of copulation.

8. The number of univalent chromosomes in the second polar spindle is twenty-four, of which the second polar body receives twelve, leaving an equal number to form the egg nucleus.

9. The second polar body is formed only after the egg has been fertilized.

10. The first and second polar bodies differ in size, shape, and especially in chromatin content, so that they are easily distinguishable.

11. At least the greater part, if not the entire sperm tail enters the egg at the time of fertilization.

12. Since the mouse egg in every case which we have observed forms two polar

bodies of typical constitution, its maturation processes are in accord with those of most other metazoon eggs.

The 'Accessory Chromosome' in Anastristris: KATHARINE FOOT and E. C. STROBELL, New York.

The authors interpreted the so-called chromosome nucleolus of the resting spermatocyte as the homologue of the nucleolus of the egg and not as a chromosome, as maintained by the cytologists who have previously investigated this form. They interpreted the so-called heterotropic chromosome as a bivalent, representing in value two spermatogonial chromosomes and not one. In a series of forty-nine photomicrographs they traced it from the early prophase to the telophase of the second division, demonstrating its division both in the first and in the second spindle. Three of the photomicrographs showed spermatogonia in which twenty-two chromosomes were demonstrated.

Secondary Chromosome-couplings in Hemiptera and their possible Significance: EDMUND B. WILSON, Columbia University.

As secondary chromosome-couplings we may designate unions or associations of the chromosomes that take place independently of synapsis, such as those described by Sinéty in *Leptynia* and by McClung in the *Acrididæ*. In the spermatogenesis of the *Hemiptera heteroptera* such couplings occur in several genera. In *Pachylis gigas* the 'accessory' or odd chromosome often couples with one member of one of the bivalents in the first spermatocyte-division and passes with it to one pole, but the process is inconstant and appears to be of a casual character. In *Thyanta custator*, on the other hand, there is a small unpaired chromosome that is always separate from the others in the first division but in the second is invariably coupled with

one member of the smallest pair of chromosomes and passes with it undivided to one pole. *Metapodius* presents a still more interesting relation. Here a small unpaired chromosome is present in some individuals, but not in all, in addition to a pair of typical unequal idiochromosomes. The latter show the usual relation to sex-production, while the unpaired chromosome may be present in either sex and hence is of different nature from the odd or 'accessory' sex-chromosome. Here too the unpaired chromosome is always separate from the others in the first division, but in the second it is in about 80 per cent. of the cells coupled with one of the idiochromosomes. In a marked majority of cases the coupling takes place with the small idiochromosome, and the unpaired chromosome passes to the male-producing pole; but in some cases the coupling is with the large idiochromosome. We should, therefore, expect to find the unpaired chromosome present in a majority of the male individuals and in a minority of the female ones; and this is borne out by the data as far as they go, though they are somewhat scanty. Of seven males (testes) five possess and two lack this chromosome. Of five females (ovarian cells) but one possesses while five lack this chromosome. The conditions are constant in each individual.

These facts suggest that if the chromosomes embody the primary factors of heredity, the coupling of chromosomes may give the physical basis of certain forms of character-couplings. For instance, the coupling of the sex-characters with the somatic species-characters observed in certain forms of Mendelian hybrids in *Lepidoptera* may be due to a coupling of the sex-chromosome with one of the other chromosomes, of the same general nature as that observed in *Metapodius*. The study of the chromosomes in such cases in

combination with experimental work may thus give a decisive test of the general chromosome-theory of heredity.

Maturation Processes in Paramecium caudatum: GARY N. CALKINS, Columbia University.

On the Formation of Regenerative Masses in Sponges allowed to degenerate in confinement: H. V. WILSON, University of North Carolina.

Silicious sponges (*Stylotella*, *Microciona*) kept under favorable conditions in aquaria undergo degenerative changes, resulting in the formation of small masses of unspecialized tissue, which lie scattered through the dead sponge, like gemmules in a *Spongilla*. Such masses when returned to the normal environment transform into perfect sponges.

The Influence of a Strong Centrifugal Force on the Egg of Arbacia: T. H. MORGAN and E. P. LYON.

The Influences of External Factors, Chemical and Physical, on the Development of Fundulus Heteroclitus: CHARLES R. STOCKARD, Columbia University.

1. *Fundulus* eggs develop normally, although at a somewhat faster rate, when kept on moist plates entirely out of water. Such embryos are unable to hatch while on the moist plates, but if at any time after the control has begun hatching some of the eggs are immersed in sea-water they will soon begin hatching, commencing usually in about ten minutes after being in the water and all coming out promptly. On hatching the embryos show a positively heliotropic and a negatively geotropic reaction.

Embryos were kept thirty-three days, or twenty days after the control had begun hatching, on these moist plates without beginning to hatch. The fish within the egg membrane grows in length and absorbs

its yolk at about the same rate as hatched ones do. They finally die of starvation after having assimilated all of their yolk, being still confined within the egg membrane.

2. These eggs are not entirely immune to osmotic effects though it has often been stated that they are. In weak cane sugar solutions the yolks were observed to swell; this has not been seen even in eggs developing in distilled water, and may probably be due to some change taking place in the sugar after it has permeated the egg membrane. In concentrated sugar solutions the yolk shrinks in a somewhat definite manner. A 1.53 m distilled water solution of cane sugar killed the eggs within twenty-three hours. The osmotic pressure of such a solution is about 34.278 atmospheres, about twelve atmospheres more than that of sea-water. Some salt solutions exerting even a greater pressure do not kill the eggs. The contradiction is possibly due to the cane sugar becoming inverted in the solutions and its pressure is thus more than the amount calculated. On comparing the effects of sea-water solutions of sugar with distilled water solutions it was found that a pressure more than double as high in sea-water produced a much less marked effect. Sea-water solutions were alkaline and inversion of the sugar was not so likely to occur.

3. Several lithium salts produced similar and characteristic abnormalities in development.

4. Embryos developed in solutions of KCl show no heart beat or circulation of the blood; the circulatory system is also abnormal. NH_4Cl produces a general and indefinite effect on development. MnCl_2 causes a definite effect on the early stages of development. MgCl_2 causes the formation of cyclopean monsters. NaCl causes the embryos to swim abnormally in a twisting spiral course.

5. Mixed solutions of salts and sugar act more intensely on the *Fundulus* egg than either constituent would if used alone. A small dose of a salt will give the effect of a much stronger dose if sugar be added to the solution.

The Degree of Correlation of Certain Internal Characters in the Toad: W. E. KELLICOTT, Womans College, Baltimore.

Morphogenetic Localization in Aglaophenia: RAYMOND PEARL, University of Pennsylvania.

In the plumularian hydroid *Aglaophenia helleri* each fully grown internode of the hydrocladium is divided into three regions by two incomplete, transverse, chitinous septa or ridges. The proximal one of these ridges is at the level of the intrathecal ridge, and the distal one is at the level of the proximal border of the supracalycine nematophores. A study was made of the proportionality of the parts of the internode marked out by these ridges. The general results may be stated as follows: (1) Those proportions of the individual internode and hydrotheca (= person) which involve the localization of points by a process of differentiation *in situ* after growth is entirely or nearly completed, are maintained in different persons with very much less constancy or precision than are those proportions which depend primarily on growth (as distinct from differentiation) localizations. (2) There is a distinct correlation between the proportionality of the parts and the absolute size of the person in *Aglaophenia*. In this as in all other cases which have so far been studied quantitatively with reference to this point, the actual facts are in direct contradiction to the fundamental assumption made by Driesch in the development of his so-called 'first proof of the autonomy of vital phenomena,' to the effect that the proportionality of the parts of an organism

is something quite independent of the absolute size.

Correlation as the Basis for Selection in Lepidoptera: H. E. CRAMPTON, Columbia University.

The Blending and Overlap of Instincts: FRANCIS H. HERRICK, Western Reserve University.

There are many anomalous actions or peculiarities of behavior in wild birds which have not been satisfactorily explained, although certain of them have been long known. Some of the eccentricities of conduct referred to are the following: (1) Repair of the old nest or the building of a new one at the close of the breeding season; (2) omission of nest building, and dropping of eggs on the ground; (3) leaving young to perish in nest, and starting on migration; (4) offering strings or other objects to young in the place of food; (5) building more than one nest including the 'cock nests' of marsh wrens; (6) rebuilding on the same 'site,' producing superimposed nests or nests of from two to four 'stories' 'to conceal' foreign bodies, such as the cowbirds' eggs in the nests of vireos and warblers.

All of these curious actions receive much light, and in most cases are satisfactorily explained by what we shall call the blending or overlapping of instincts. As shown in another paper, the wild bird commonly passes through a cycle of instincts which mark the breeding season. This cycle is made up of eight or more terms, which follow in serial order, and some of which are recurrent. Normally the bird passes from center of influence 1 to center 2, 3, and so on, to the end of the cycle. There is little overlap or blending, the bird remaining under the influence of a given instinct or series of instincts, such as nest building, incubation, or feeding the young until its instinct in any given direction has

been satisfied, before entering a new sphere or being swayed by new impulses. When the correlation or attunement is perfect the instincts of mother and child fit like lock and key. To change the figure, like clocks beating synchronously the instincts of parent and child are generally in harmony, but one of the clocks occasionally gains or loses, stops or runs down; one term is liable to be weak or to drop out altogether, so that there is an overlap or a gap in the series which may be serious. On the other hand, one term may be unduly strengthened, like nest building or incubation, and a preceding or following term correspondingly weak. In all such cases there are eccentricities of conduct, which, if not fatal to the young, are very puzzling to the naturalist.

Most wild birds normally pass one reproductive cycle in the season; a certain number, however, begin, but do not complete a second cycle; further, many like the robin and bluebird not only begin but complete a second and even a third cycle within the breeding period.

The repair of the old nest in autumn by fish hawks or eagles is not done 'in anticipation of spring,' and implies no more intelligence than the building of the original nest. It is simply the recrudescence of the building instinct, due to the beginning of a new reproductive cycle which is never finished.

Leaving the young to perish in the nest in autumn is brought about by the scamping of the cycle at the other end. The migratory impulse overlaps and replaces the parental instinct.

An adult robin has been seen to offer a string to its fully grown young, and try to cram it down the throat of the fledgling. Later, the old bird flew with the string into a tree. This was the result of the overlapping of two reproductive cycles, or of

the last term of one cycle, and the first term of a succeeding cycle. The bird was alternately swayed by opposing impulses, now being impelled to gather nesting material, when she picked up the string, now by parental instinct to feed her young, when she tried to serve it, and again possibly by the instinct of building when she flew with the string into a tree.

Building more than one nest can be accounted for by excessive development of the building instinct, or by the influence of fear repeatedly interrupting the cycle, together with attachment to nesting site, but the discussion is too long for this abstract.

The rebuilding of nest on nest, giving rise to the wonderful storied structures sometimes produced by the summer yellow bird, or vireo, when plagued by the cowbird, so that the foreign egg is buried out of sight, is not an illustration of reason, as commonly believed, but the curious result of a pure instinct. The reproductive cycle is broken by fear, and a new one is begun, and in these rare cases the old nest is retained as a *site to be built upon*. Instead of having two *supernumerary* nests, both of which may contain eggs, as in reported cases of the phoebe, we have a series of *superimposed* nests. The new nest is not built to *conceal* the cowbird's egg, although it does this perfectly, any more than the addition of new materials to the osprey's nest in the fall is in the nature of repairs, although it answers this purpose admirably. The nest is built because the bird is at the opening of a new cycle, and is impelled by the building instinct.

Many confirmatory facts could be given. The herring gull will not only bury an egg, in rebuilding on its old site, in this case the discarded nest, when its cycle has been interrupted by fear, but will bury its dead young which it treats as so much nesting material.

Notes on the Behavior of Sea-Anemones:

CHAS. W. HARGITT.

The paper discussed the aspects of behavior of several species of sea-anemones studied both under natural conditions and those of the laboratory. The points chiefly under observation had reference to the behavior of these creatures under the influence of light. So far as known few details along this line have been recorded.

At least three species of anemones were found which showed very evident reactions to photic stimuli, namely, *Eloactis* (*Halcompa*) *producta*, *Sagartia modesta* and *S. leucolena*. Of these two are tubedwelling, burrowing in the sand near tide lines, and forming rude tubes or burrows through the adhesive secretions of the ectoderm. *S. leucolena* is occasionally found in similar habitat, though chiefly adhering to rocks or among colonies of ascidians, or sponges, on piles of docks, etc. Experiments showed that the first two species are most sharply responsive to light, and this sensory sense is located chiefly in the tentacles and oral regions of the body. *S. leucolena*, while less sensitive, is yet evidently so in strong light. Exposed to direct sunlight it quickly closes up into a hemispherical mass, or creeps over the edge of the rock or shell into shaded portions, of the aquarium. In its native haunts it may be found protruding its crown of tentacles from a crevice while the body is hidden.

Sagartia luciae is a free-living species found abundantly almost everywhere, on rocks in open pools, or on floating fucus, and freely exposed to direct sunlight, action of waves, etc. Of similar habit is *Metridium marginatum*. Neither of these species seems in the least degree responsive to photic stimuli. Under a strong beam of sunlight reflected directly upon them for ten minutes they showed no response whatever.

These facts, together with others as to food-habits, etc., render it quite certain that their behavior is due to several factors, and that in response to light there is an evidence of adaptation involving varying physiological conditions, of which the burrowing habit is one of several expressions.

The Simulation of Death by Fishes:

ULRIC DAHLGREN, Princeton University.

Spawning Behavior and Sexual Dimorphism in Fundulus heteroclitus and Allied Fish: H. H. NEWMAN, University of Michigan.*Some Points in the Development of the Florida Alligator:* ALBERT M. REESE, Syracuse University.*External Morphology of the Head of Limulus:* WILLIAM PATTEN, Dartmouth College.*The Function of the Gastrolith of the Lobster:* L. W. WILLIAMS, Harvard Medical School.

The gastrolith appears for the first time in the fourth stage lobster at or before the middle of the period between the molts and, after the molt, there proceeds, *pari passu* with the dissolution of the gastrolith, a hardening of the gastric teeth, the mandibles, and the chelipeds. Soon after the absorption of the gastrolith the newly molted lobster attacks and eats the greater portion of its cast. Reasoning from these facts, we suggest that the lime in the gastroliths is reserved for the rapid hardening of the teeth, mandibles and chelipeds so that the relatively vast supply of lime in the slough and in other shells may be made available, at once, for the hardening of the new shell.

This paper is to appear in the Report of the Rhode Island Commission of Inland Fisheries, now going to press.

The Artificial Production of a Single Median Eye in the Fish Embryo by Means

of Sea-water Solutions of Magnesium Chlorid: CHARLES R. STOCKARD, Columbia University.

Fundulus embryos when developed in certain strength solutions of $MgCl_2$ in sea-water form a large single median eye. This condition is comparable to the one eyed human monsters known as *Cyclops*, *Cyclopia* or *Synophthalmia*.

The single eye results from an antero-medio-ventral fusion of the elements of the two optic vesicles at an early developmental stage. This fusion is more or less complete in the different embryos.

The large compound optic cup induces the formation of a single lens. This lens is formed from ectoderm different in position from that of the normal lens-forming region. The lens is abnormally large in size as is also the optic cup, and the size of the former varies directly with that of the latter. It is probable that there is no localization of lens-forming substance in the ectoderm of the fish embryo. This inter-relationship in the development of the optic cup and lens is interestingly compared with the processes of development in the amphibian eye as shown by recent experiments.

Mixed sea-water solutions of $MgCl_2$ and $NaCl$ also cause the one-eyed condition. Since such a defect is characteristic of the $MgCl_2$ action when used in sea-water solutions one must infer that the Mg constituent in the mixture is responsible for the result.

Method of Making Series of Anatomical Drawings: G. A. DREW, University of Maine.

The Influence of Direction vs. Intensity of Light in Determining the Phototropic Responses of Organisms: LEON J. COLE, Kingston, R. I.

The large land planarian, *Bipalium kewense*, was the principal animal experi-

mented with. Its responses were first tried to shadows from a light directly overhead, i. e., non-directive. It was then tested in a partial shadow, a strip of less intense light in an area of more intense illumination. In this case all the light came from one direction, namely, horizontally, from one side. Although strongly negative, the worms would crawl directly toward the light in the partial shadow rather than turn out into the greater intensity. A similar result was obtained with the earth-worm (*Allolobophora fatida*). In these experiments *Bipalium* and *Allolobophora* appeared to respond to intensity alone, regardless of the direction of the impinging light.

Chromatin Changes in Hydroids: W. M. SMALLWOOD, Syracuse University.

The Sexual Phase of the Life Cycle in Amæba: M. M. METCALF, Oberlin College.

The Existence of an Organ of Equilibration in Certain of the Lower Crustacea: C. O. ESTERLY, Harvard University. (Introduced by E. L. MARK.)

The Habits and Life History of Cryptobranchus alleganiensis: BERTRAM G. SMITH. (Introduced by Dr. O. C. GLASER.)

The adult *Cryptobranchus* has its dwelling place in a cavity or cavern under a large rock, in swift and shallow water. The animal seldom comes out during the daytime, except during the breeding season. The eggs are laid and fertilized during the first two weeks in September. They are deposited in the usual dwelling-place of the animal. About 450 eggs are laid by a single female. Fertilization is external as in fishes; no spermatophores are formed. After the eggs are deposited they are usually guarded for a time by the male, who fights and drives away other hell-

benders which attempt to eat the eggs. The male himself eats some of the eggs, but on account of the slowness of his digestion is unable to eat more than a small proportion, hence his presence is in the main protective. In defending the eggs the male is merely guarding his own food-supply; the origin of the brooding habit in this case seems to be the feeding habit. The eggs hatch about six weeks after fertilization. The newly hatched larva is about 25 mm. long, and has a large yolk sac. Larvæ kept in the laboratory for two months after hatching retain a remnant of the yolk sac, and refuse food. Year-old larvæ are 6-7 cm. long, and retain the external gills. Larvæ two years old are about 12 cm. long and the external gills are greatly reduced. Sexual maturity is attained with a length of about 34 cm. and probably requires three or four years.

Relations between Regeneration, the Degree of Injury, and Moulting in Young Lobsters: V. E. EMMEL, Brown University.

The phenomena of regeneration and moulting in the lobster present two distinct processes of cellular activities. The one, moulting, is going on more or less continuously throughout the period, or cycle, between moults: the other, regeneration, may be artificially induced at various points within this cycle. The problem is: what influence do these two processes exert upon each other?

A series of experiments were made on fourth stage lobsters to determine—first, the influence of regeneration upon the duration of the moulting cycle, or period between moults; second, the rate of regeneration at different stages of the moulting cycle; and third, the effect of different degrees of injury upon moulting and regeneration. The results obtained seemed clearly to demonstrate the following points:

1. That the effect of regeneration is to retard the process of moulting; and that this effect varies according to the time of mutilation, so that the later the process of regeneration is induced in the moulting cycle, the greater is the duration of the period between moults.

2. That, on the other hand, the rate of regeneration varies also according to the time of mutilation, so that the later the mutilation is made in the cycle, the more rapid is the rate of the ensuing regeneration.

3. That the greater the degree of injury, the slower the rate of regeneration, and the greater the duration of the moulting cycle.

These experiments, therefore, indicate that there is an interaction between the two processes of regeneration and moulting, of such a nature that the introduction of one will disturb the normal activity of the other. Since, also, this interaction varies at different times in the moulting cycle, it emphasizes the importance of taking this factor into account when drawing conclusions from experiments made upon crustacea and other animals which undergo ecdysis.

C. JUDSON HERRICK,
Secretary

SCIENTIFIC BOOKS

L'Attention. By. W. B. PILLSBURY. Paris: Doin, 1906. 8vo. Pp. 304. Bibliothèque Internationale de Psychologie Experimentale.

A sufficient number of the fifty volumes that are to form this series of handbooks of experimental psychology have appeared to justify the plan of the whole and to demonstrate their serviceability. Professor Pillsbury's volume on the attention is well conceived and well executed; it is so particularly from the point of view of the student, and thus will be a welcome addition to the pedagogical literature when available in English.

It is quite inevitable that such of the topics as are not divided by fairly settled contours of material should largely encroach upon one another's field. Attention can not be considered without equally considering the associative processes, the memory, perception, imagination and the other accepted rubrics of an academic psychology. It is accordingly the attentive side of consciousness, the attentive aspect of the mental moment and the mental movement that is thus singled out for monographic presentation. Professor Pillsbury's presentation and his conclusions alike bring this relation prominently before the reader, and produce the feeling of studying interesting aspects of a natural psychic species, not of a dissected specimen.

The volume falls into two portions; the one concerned with the exposition of the data, the other with their theoretical interpretation. In the former portion the essentially psychological *Leitmotiv* is well maintained, and physiological data (or suppositions) are never allowed to obscure or replace the essential fact that our knowledge of the attentive life is introspectively derived, though exercised upon objectively definite situations and measurably subject to verifiable experimentation. Attention is an expression of the emphasis and selection of the possible stimuli or occupations of consciousness by which the mental movement takes its direction, guides its course and shapes its progress. It brightens and clarifies a portion of the field, creates momentary foci, gives definiteness and contouring to the mental play, converts it from a nebulous monotone to a significant though shifting chiaroscuro. It is not a vague, formal or abstract concept, but is embodied in the mode of action of the nervous system as the mechanism of the mind. It thus has interesting motor accompaniments, that adjust the perceptive mechanism to finer, more discerning service, that quicken the intensity of the mental moment, and reveal their existence in independence or defiance of volition. Attention finds its course determined by all sorts of conditions; yet notably these divide according as they are objectively characteristic (the intensity and accumulative

force of the appeal) or, more influentially, by the subjective factors. These really summarize the entire life history of the race and the individual, his heredity and social heritage, his temperament and naturally his momentary condition of mind and body. Interest is but a gauge, not a creator of attention; and to say that we attend to what is interesting but calls attention to the underlying community of many of these factors. Nor is attention explained by its motor accompaniments and expression. These, like the scope of the attentive searchlight, like the fluctuations under fatigue, reflect its close dependence upon physiological conditions. Attention guides and selects in the sensory as in the intellectual field, and thus becomes an expression of the mental totality or consciousness. It plays a like part in the representative field of memory and association as in the presentative field of sensation and perception; for in truth all these processes shade into one another; and their composite nature characterizes the whole mental life.

On the side of theory the most important issue is the rôle of apperception, whose functional efficiency is recognized by the subjective aspects of the attentive process. The varieties of formulation of the 'apperception' theories are so various and the differences between them so elusive, that the reader will be grateful for Professor Pillsbury's guidance, which includes as well a survey of the historical field. Next in importance is the motor theory of attention; while each of these types and their varieties takes note of—as certain theories exclusively consider—the physiological bases of attention. Professor Pillsbury's view has the merit of merging the points of emphasis of the several explanations and of presenting the attentive process not as an isolated faculty or function, but as an aspect of the totality of the natural mental state.

Reduction of these conclusions to a phrase or an outline is impossible; and the reader must be referred to Professor Pillsbury's brief résumés for a suggestion of the theoretical and controversial aspects of the attention. These, when closely considered, reveal their

intensely academic character; and an adherence to one or another depends upon the bent of one's philosophic allegiance and temper.

JOSEPH JASTROW

The Value of Pure Water. By GEORGE C. WHIPPLE. New York: John Wiley & Sons. Pp. 84. Price, \$1.00.

This small publication, which contains much material of both interest and value, is practically a reprint of portions of three earlier papers by the author. One from 'Biological Studies by the Pupils of William Thompson Sedgwick,' another from 'The Pollution of Streams and the Natural Agencies of Purification' and a third on 'The Disadvantages of Hard Water.'

Among the qualities of a public supply which affect the consumer 'temperature' is included. This is well, for that item receives far too little attention from those who forget that the great bulk of the people can not afford the luxury of ice.

As showing the advantages of filtration, a comparison between the typhoid rates in Albany and Troy is striking, but it should be noted that Troy never drew Hudson River water from below the mouth of the polluted Mohawk, and now takes no river water at all. In showing the pecuniary loss to a community due to water-borne typhoid, the author places the 'residual typhoid,' or number of yearly deaths not traceable to water, at a probable value of 20 per 100,000. He adds, however, that this value will doubtless diminish in the future because of a gradual decrease in the number of foci of infection. A good table is given showing the increase in cost to the laundry interests resulting from the use of hard water, and a formula is added whereby may be calculated the depreciation of the money value of a water for soap users because of hardness.

Additional formulæ are given which severally state the depreciation due to 'sanitary quality' to 'temperature' and to 'physical characteristics,' under which latter head are included 'turbidity,' 'color' and 'odor.' Odor is again divided into that due to 'organ-

isms,' to 'decomposition' and to 'vegetable odors.'

This is all well enough, but the resulting complexity of formulæ is somewhat more than the average water purveyor might wish for.

"Habit and association have much to do with a person's views as to the attractiveness of water" is a most true statement, and upon it depends the success with which many an indifferent supply is now offered to the public.

The book is well worth its price and should be found in every water library.

W. P. MASON

Alcohol—The Sanction for Its Use Scientifically Established and Popularly Expounded by a Physiologist. Translated from the German of Dr. J. STARKE. New York, G. P. Putnam's Sons. 1907.

This book, written in defense of the use of alcohol, appears at a time when there is a world-wide movement in favor of a stricter temperance. By alcohol the author means the substance as contained in the purer beverages, not such concoctions as absinth which are compared to alcoholic solutions of opium.

The moderate drinker who experiences 'internal mental exaltation with perfectly clear consciousness' has no poisoning of the brain provided it is only occasionally that he gets 'elevated.' The book claims that a medium amount of alcohol is favorable to the performance of muscular work, and a medium allowance is put at 560 c.c. of absolute alcohol or two and three quarter pints of brandy for a man weighing 140 pounds. The author states that caffein constricts the cutaneous blood vessels and enlarges those of the interior, and since alcohol behaves in the opposite manner, therefore rum should be taken in tea and a liqueur after coffee.

While this volume will scarcely meet with unanimous approval, it might still be recommended as an antidote to the attenuated non-sense of the 'scientific temperance' of the school books.

GRAHAM LUSK

SCIENTIFIC JOURNALS AND ARTICLES

The American Museum Journal for April contains illustrated accounts of the 'Habitat

Groups of Birds,' 'The Museum's New Whales' and 'The Results of the Tjader Expedition.' It also notes that Mrs. Roesler has been appointed as guide to the collections for members visiting the museum. In this connection it may be noted that the Museum of Fine Arts, Boston, has just added to its staff a *Docent* whose office is to take parties, not exceeding ten in number, about the museum and explain the collections.

The Zoological Society Bulletin for April is termed the Aquarium Number and is devoted entirely to aquatic animals. It contains articles on 'The Care of Goldfishes' and 'The Care of Turtles and Small Alligators,' 'The Centennial of the Aquarium Building' with a cut showing its appearance in 1852. Other articles are on 'Poisonous Fishes,' 'The Drum Fish,' 'Blind Fishes' and 'The Uses of the Fins of Fishes.' The measurements are given of two unusually large sea turtles, one a loggerhead, weighing 395 pounds, the other a green turtle, weighing 540 pounds.

Bird-Lore for March-April has for its principal articles 'The House-Finch from an Office Window,' by W. H. Bergtold; 'Bird Clubs in America, III., The Maine Ornithological Society,' by J. Merton Swain; 'Clay Bird-Houses and Bird-Baths,' by R. W. Hegner, and the second paper on 'The Migration of Thrushes,' by W. W. Cooke. The Educational Leaflet, by Mabel Osgood Wright, is on 'The Red-winged Blackbird.' The report of the Audubon societies gives a résumé of various laws proposed or passed.

The Museums Journal of Great Britain for March contains various contributions to the discussion on museum cases which formed a feature of the last meeting, including a description of a 'Rotary Cabinet for Museum Specimens,' by Rev. S. J. Ford. This cabinet contains 22 trays which may be successively brought to the top, which is glazed, in order that their contents may be seen.

ANNOUNCEMENTS have been sent out from Bologna, Italy, of the publication there in the immediate future of a new scientific review, to be called *Rivista di Scienza*, which is de-

scribed by the editors as 'an international review of scientific synthesis.' This new publication is not intended to present the results of special investigation in narrow fields, but rather to take a wide look over all the lines of scientific activity and to review in each in as clear and simple a way as possible the work which is being done and the problems which are coming up. Biology, chemistry, physics, mathematics, geology, sociology, political economy, psychology and pedagogy are all represented in the list of articles which are to appear in the first numbers. Subjects of general interest in all branches of scientific work will be presented, and treated in a manner as little technical as possible in order that they may be intelligible to a wide circle of readers. The correlation and connection between different groups of sciences are to be particularly developed. It is to be cosmopolitan in its outlook and almost every country in which scientific work is being done is already well represented in the list of contributors. "It is born," say the editors, "from the desire to coordinate the work carried on in different fields of knowledge and to make the task of synthesis easier" and "it invites such studious persons as are desirous (without sacrificing time employed by them in the certain way of analytical research) of discussing in its columns the general questions regarding their special branch of science, to set forth in a widely accessible form the results obtained from it. It hopes especially to have the collaboration of those who desire to study the relationship, ever new and ever closer, which exists between the different branches of study, and it counts on the favor of all those who recognize the danger of excessive specialization and would be glad to promote a wider appreciation of the problems of science." It is to be issued quarterly and each number will contain from 150 to 200 pages, forming an annual volume of from 600 to 800 pages. Two editions are to be issued: one, an international edition in which each article will appear in the language of its author, and another intended for circulation in Italy in which all articles in any foreign language other than

French will be translated into Italian. The committee of management is made up of G. Bruni, A. Dionisi, F. Enriques, A. Giardina and E. Rignano. Among those who have already undertaken to contribute articles are: Bredig, Ciamician, Ostwald and Wegschneider in chemistry; Borel, Larmor and Thomson in physics; Boutroux, Fano, Picard and Severi in mathematics; Delage, Giard, Grassi, Hartog, Raffaele, Roux (W.) and Sedgwick in zoology and anatomy; Abegg, Burian and Dastre in physiology; Darwin, Haberlandt and Wiesner in botany; Benini, Bortkiewicz, Carver, Mosca, Pareto, Sombart and Supino in sociology and political economy; Brugi, Gropali and Scialoia in law; DeMarchi, Love and Wallerant in geology; Binet, Janet and Lugaro in psychology; Cunningham and Salvemini in history, and Credaro and Tannery in pedagogy.

SOCIETIES AND ACADEMIES

AMERICAN MATHEMATICAL SOCIETY

At the regular meeting of the society, held at Columbia University on Saturday, April 27, an especially attractive feature of the program was Professor W. F. Osgood's presidential address on 'The Calculus in our Colleges and Technical Schools.' The address will appear in the June number of the *Bulletin* of the society. The attendance at the April meeting, always ranking next to that of the annual and summer meetings, exceeded on this occasion all previous records, amounting to about seventy, including sixty-one members.

President H. S. White occupied the chair at the two sessions. The council announced the election of the following new members: Dr. Alfred Ackermann-Teubner, Leipzig, Germany; Dr. J. W. Bradshaw, University of Michigan; Professor H. E. Cobb, Lewis Institute, Chicago, Ill.; Mr. S. A. Corey, Hiteman, Ia.; Professor Floyd Field, Georgia School of Technology; Mr. G. W. Hartwell, Columbia University; Chancellor C. C. Jones, University of New Brunswick; Mr. Joseph Lipke, Columbia University; Professor Francis Regis, Christian Brothers College, St. Louis, Mo.;

Mr. H. P. Stillwagen, Yeatman High School, St. Louis, Mo. Seven applications for admission were received. The total membership of the society on May 1 was 560.

Following the plan recently adopted, abstracts of the papers so far as available had been printed and issued to the members in advance of the meeting. In this way it is hoped to secure a more intelligent interest in the papers and to promote criticism and discussion.

The date of the summer meeting, to be held at Cornell University, was fixed for Thursday and Friday, September 5 and 6.

By no means the least enjoyable feature of the meeting was the usual dinner in the evening, attended on this occasion by over twenty of the members.

The following papers were read at this meeting:

G. A. BLISS: 'A new form of the simplest problem of the calculus of variations.'

R. D. CARMICHAEL: 'Multiply perfect even numbers of five different primes' (preliminary communication).

L. P. EISENHART: 'Transformations of surfaces whose lines of curvature are represented on the sphere by an isothermal system.'

F. L. GRIFFIN: 'The variation of the apsidal angle in certain families of central orbits.'

F. L. GRIFFIN: 'The solutions of central force problems as functions of the constant of areas.'

F. L. GRIFFIN: 'Note on a simple example of a central orbit with more than two apsidal distances.'

G. A. MILLER: 'Note on the commutator of two operators.'

J. E. WRIGHT: 'Arrangement of ovals of a plane sextic curve.'

W. F. OSGOOD: Presidential address—'The calculus in colleges and technical schools.'

IDA M. SCHOTTENFELS: 'Group matrices.'

C. E. STROMQUIST: 'An inverse problem of the calculus of variations.'

R. G. D. RICHARDSON: 'On the integration of a series term by term.'

A. L. UNDERHILL: 'Invariants of the function $F(x, y, x', y')$ under point and parameter transformations connected with the calculus of variations.'

EDWARD KASNER: 'The motion of particles under conservative forces.'

EDWARD KASNER: 'Isogonal and dynamical trajectories.'

P. L. SAUREL: 'On the distance from a point to a surface.'

T. E. MCKINNEY: 'On coneylic quantities.'

T. E. MCKINNEY: 'On continued fractions representing quadratic irrationalities.'

G. A. MILLER: 'Groups generated by n operators each of which is the product of the $n-1$ remaining ones.'

F. N. COLE,
Secretary

THE AMERICAN CHEMICAL SOCIETY. NORTH-
EASTERN SECTION

A Correction.—In the report of the proceedings of the seventy-fifth regular meeting of this section (this journal, p. 669), through a mistake of the undersigned, the following statement appeared: "For three semesters, the speaker was Wöhler's assistant and took part in the researches on aluminium, silicon, boron, etc." * * * Dr. Remsen was not Wöhler's assistant and did not take part in the researches on these elements, but did later make them under Wöhler's personal direction, by methods which had already been worked out. The speaker left Göttingen in 1870 and became assistant to Fittig at Tübingen. With a view to correcting the false impression given by the above-mentioned report, these few lines are put forth with the hope that they may fall under the eyes of most of the readers of the original report.

FRANK H. THORP,
Secretary

DISCUSSION AND CORRESPONDENCE

THE FIRST REVISER OF SPECIES

I HAVE followed with much interest the recent discussion in *SCIENCE* by Messrs. Stiles, Stone, Jordan and Allen on the proposed new rules in zoological nomenclature. The subject is one of especial concern to me at the present time as involving the propriety of numerous generic names in a work now publishing. I wholly agree with Dr. Allen in his views regarding elimination, and concur quite with his statement that elimination is practically the only rule in use by systematists, at least so far as that especial group of in-

sects with which I am best acquainted is concerned. I believe that, upon the whole, it is the safest and most expedient rule, and one which meets the approbation of most taxonomists. Next to this I would accept the rule of the 'first species,' one that has often been used by entomologists, especially where there has been no doubt as to the meaning of the original describers.

But the first species rule would be unjust when applied to certain writers. It is well known that Meigen, the 'father of dipterology' did not consider the first species as the most typical of his genera, but rather, with the last species, as the most aberrant, and these were the ones he usually figured. Wiedemann, a very prolific describer of exotic diptera on the other hand, arranged his species in his genera usually in the order of their size, and the first here would not in the least represent his most typical species.

As to the rule of the 'first reviser,' when applied to work done in the past, I consider it vicious; so utterly unjust and revolutionary that it is to be hoped it will be stifled in its birth. I, for one, shall never recognize it. Its chief use would be to give unlimited license to the library naturalist, now that 'new genera' are not so common as they were. I will mention a single instance of the effect it would have in a case that has recently been brought to my attention. There is perhaps no genus of flies better known, save *Musca*, than the genus *Syrphus*. Fabricius named the genus in 1775, giving a list of numerous species belonging to it, a composite genus of course, as all of Fabricius's genera were. In 1839, one Curtis, knowing little, critically, of diptera, in a general work on British insects, capriciously designated the nineteenth of Fabricius's species as the 'type' of *Syrphus*. In 1860, Schiner, perhaps the ablest student of diptera, and one of the most conscientious that we have ever had, subtracted one of these original species, which happened to be this 'type' of Curtis, as the type of a new genus *Leucozona*. The genus *Syrphus*, the type of the family Syrphidæ, with all its eliminations, now comprises a hundred or two species distributed in nearly all parts of the

world. The genus *Leucozona* includes a single species, possibly two. In accordance with this iniquitous, *ex post facto* law of the 'First Reviser' it is now proposed to apply the name *Syrphus* to this single species and to give to the hundreds now called by that name, the name of a synonym made years ago by the greatest blunderer that ever wrote on entomology. Schiner was remarkably conscientious, following the usages and rules of his time closely. He, of course, could not imagine that the future historical naturalist would impose so absurd a rule as would make the carelessly designated and wholly unwarranted 'type' of Curtis compulsory; did not dream that it was necessary for him to look through the writings of every author of high and low degree to see whether Fabricius's types had been arbitrarily fixed. His work was done in good faith.

This is but one example of the workings of this newly proposed, *ex post facto* law. There are scores of others not unlike it; in fact, dipterology will be a small chaos until all the present works on the science have been rewritten, and a paradise of the name tinkerer, if such a rule obtains.

I should not object to the 'first species' rule, if it were not made retroactive in such cases as would upset other names established by elimination. Surely those of the past who have done able and conscientious work under accepted usages should not be stigmatized at the caprice of any self-constituted authority. And what assurance have we that a few years hence some other *ex post facto* law will not be invoked to do the work all over again? New writers will have little opportunity to propose new generic names unless some such historical mine is opened up.

I really believe that the final solution of the ever-growing controversies and apparently never-ceasing changes will be some such commission as Dr. Davenport has recently suggested, an accepted commission to pass upon the validity of names without regard to priority or anything else. And one of the first rules that I should attempt, were I a member of such a commission, would be that he who digs up a name that has been buried

for fifty years to replace some other in common use, should be ostracised and debarred from all further use of reputable scientific journals.

S. W. WILLISTON

TYPES OF GENERA BY FIRST SPECIES

IN a recent article¹ it is claimed that the first species method is opposed to the law of priority, since it supersedes the action of the first reviser. It is only necessary to reply that the action of the original author always precedes that of any possible reviser, and since the first species method determines the type of the genus solely from the first publication of the original author, it is obviously more in accord with the law of priority than any other method.

The same writer makes the surprising statement that the method of elimination and that of the first reviser are parts of one method. As a matter of fact, they are almost diametrically opposed. The elimination method, or the method of residues, tends to leave as the type of the original genus the one left last after all removals. This is usually the most obscure or unrecognizable species, since the more prominent ones are generally first selected as the types of new genera, or are otherwise removed. The first reviser method, or that of the nomination of types, tends to select some prominent species as the type of the old genus, since such will naturally be first selected by some later author as an illustration. These two opposed rules are, unfortunately, capable of being mixed in various ways (one of which is illustrated in the article here referred to), allowing of almost an infinitude of methods of selecting types. It is this extreme and most undesirable latitude in the rules that renders those most lately promulgated so unsatisfactory and impracticable.

HARRISON G. DYAR

U. S. NATIONAL MUSEUM,
April 19, 1907

A SHEEP-GOAT HYBRID

WHAT seems to be a hybrid between a sheep and a goat was produced this spring on the

¹ SCIENCE, n. s., XXV., 625, 1907.

farm of Mr. E. Arnaud, Monett, Mo. Mr. Arnaud maintains a herd of sheep and with them keeps two goats, a male and a female. There is only one female goat on the place, and she brought a kid three weeks after the animal in question was born. The hybrid is a twin to a lamb that is not a hybrid. The maternity of the supposed hybrid is not absolutely certain. Mr. Arnaud found the lambs when they were perhaps an hour old. No other sheep or goats were near, though there were others within the same enclosure. The ewe evidently regarded both the animals as her progeny. The twins are inseparable, one being an ordinary lamb, the other in most respects a goat. The tail is intermediate in length between that of a sheep and a goat, and the ears closely resemble those of a sheep. The coat is apparently that of a goat. The male goat on the farm is of mixed breeding and is white with a few reddish hairs showing on the upper part of the neck. The supposed hybrid has most of the hairs of the body of this reddish color. Mixed with them are much shorter hairs which appear like white wool. They have not yet been submitted to examination to ascertain their real nature.

While the evidence is not absolutely conclusive, there is strong reason for believing this individual to be a hybrid. Mr. Arnaud fully appreciates the importance of the freak, and will preserve it for future study and experiment. The writer would greatly appreciate information concerning other hybrids of this character.

W. J. SPILLMAN

U. S. DEPARTMENT OF AGRICULTURE

SPECIAL ARTICLES

THE SIGNIFICANCE OF LATENT CHARACTERS¹

THOSE of you who were present at the last annual meeting of the Botanical Society, at New Orleans, will remember that I presented a paper upon the latent characters of a white bean, showing that the appearance of two new characters in the F_1 hybrid offspring of a white bean when crossed with a plain brown or yellow bean, demonstrated the presence of

¹ Read before the Botanical Society of America, at New York, December 29, 1906.

a color-pattern, and of a pigment-changer as 'latent' characters in the white bean, latency meaning simply *invisibility* and not dormancy. On this basis it was predicted that in the second generation five forms would appear according to the well-known tripolyhybrid ratio, 27:9:9:3:16. These forms in the order of the ratio are purple mottled, black (dark purple), brown mottled, brown, and white. I show you to-day samples of these five predicted types taken from the second generation.

The ratios of these several groups have not yet been determined because not all of the material has been worked over, but the presence of the predicted types—especially the presence of the two forms, plain black and brown mottled, which were not known to have ever occurred in the ancestry on either side—sufficiently demonstrates the correctness of my interpretation of the allelomorphic composition of the parents. Some additional unexpected types were found which must await further breeding experiments before their significance can be profitably discussed.

It will be remembered that the condition I assumed for these hybrid beans was used to bring into harmony with simple Mendelian hybrids the apparently anomalous results of Tschermak, Emerson, Lock, Bateson, Correns, Cuénot and Castle. The prediction that the same conception of latent characters in the sense of *invisible*, not *inactive* ones would without doubt give a solution to the intricate and otherwise apparently inexplicable behavior of stocks and sweet-peas, as studied by Bateson, was fulfilled with unexpected promptness, as the third report² to the Evolution Committee presented in March, 1906, and published later in the same year, adopts the same theory and shows that in this way practically all of the apparent anomalies of stocks and sweet-peas may be explained upon the simple basis of typical Mendelian behavior without recourse to the hypallelomorphs or compound units earlier assumed by Bateson.

² Bateson, W., Saunders, Miss E. R., Punnett, R. C., 'Experimental Studies in the Physiology of Heredity,' Reports to the Evolution Committee of the Royal Society, Report III., 53 pp., London, 1906.

This complete demonstration that latent characters, at least in many cases, are not inactive units that may be rendered active by some unknown influence, but are, instead, units that produce a visible character only when acting in conjunction with one or more other units, justifies me in calling attention again to the significance of such characters.

In order to see the bearing of these results upon the process of evolution it is necessary to realize that what we call a unit character is not necessarily produced by the activity of a single allelomorph, and I consider it probable that few visible characters are so produced. It makes no difference how many internal units are involved in the production of any so-called unit-character, so long as there is a difference of only one unit involved in the cross. Thus, allelomorphs *ABCDEFGH* may determine a single characteristic and *ABCDEFGh* an alternative characteristic. If plants having characters so determined are crossed together, they will behave as if these were unit characters, though according to our assumption one is determined by the presence of eight dominant units, the other by seven.

The best actual examples we now have of the compound nature of certain apparently simple external characters are seen in the splendid results of Professor Bateson's studies on stocks and sweet-peas. In stocks, for instance, canescence is found to depend upon the simultaneous presence of three dominant allelomorphs wholly uncorrelated and each acting in the normal Mendelian manner. In one strain of sweet-peas two such dominant units are necessary to produce any color whatever and another unit determines whether that color shall be blue or red. This condition produces the remarkable result that the first generation hybrid between two white-flowered parents have blue or red flowers.

Similar conditions were presented in two of the papers given yesterday (December 28, 1906) on the joint program of Sections F and G of the American Association for the Advancement of Science, viz., the appearance of a 'latent' agouti factor in certain guinea-pigs, and an invisible red factor underlying black

in certain fowls as reported by Dr. Castle³ and Dr. Davenport.⁴ The characters of both these apparently anomalous hybrid products were recognized as atavistic or reversionary. The same is true of the purple-flowered hoary stocks produced from glabrous white and glabrous cream-colored strains. The same was true of flower and seed-coat color of beans and peas as found by Tschermak and Lock, and is no doubt the correct explanation of the purple mottling in my hybrid beans. Indeed, so many instances are now on record in which a cross results in reversion, that generalizations can be made with some degree of security.

These reversions indicate that the original character was *compound*, being determined by the simultaneous action of two or more, possibly many, dominant units, and that the later specific or varietal derivatives were produced by the disappearance of one or more of these original units as a dominant characteristic. Thus in the example assumed above in which the original character was determined by the dominant units *ABCDEFGH*, the later derivatives may be *ABCDEFgh*, *ABCDEFgH*, *ABCDEFghH*, etc., through all the possible permutations. May we not perhaps get in this way a comprehensive view of at least the later stages of evolution as a process of analysis due to the disappearance of one unit after another?

All the visible variations of the present plant and animal world were once involved in some generalized form or forms, and the process of differentiation pictures itself to us as a true process of evolution brought about by the change of individual character-determining units from a dominant to a recessive state. This conception results in an interesting paradox, namely, the production of a new character by the loss of an old unit.

When I first became interested in the Mendelian discipline one of the most difficult things for me to understand was the fact that, somehow, every dominant character in a plant or animal finds its recessive counterpart in

³Castle, W. E., 'On a Case of Reversion Induced by Cross-breeding and its Fixation.'

⁴Davenport, C. B., 'Reversion.'

all of its near relatives not possessing the character in question. For a time credulity balked and I was compelled to look upon character-units as figures of speech. The origin of forms from a common parent by the loss of dominancy in its several character-determinants accounts for the general presence of a recessive unit, corresponding with each dominant unit, in all the nearly related forms.

No suggestion has been made as to the nature of the change by which a dominant allelomorph becomes recessive, but if this change be looked upon as a degenerative one which may be followed later by complete disappearance of the unit it would account for the fact that hybrids between nearly related forms are usually Mendelian, while those between more distant ones are not.

I may summarize briefly as follows:

(a) What appear to be unit characters may be, and probably usually are, compound characters.

(b) New characters appear by the change of one or more character determinants from the dominant to the recessive condition.

(c) Some of the partial products resulting from this process of analysis have no externally apparent distinguishing characteristic, and these supply instances of so-called 'latent' characters.

(d) Mendelian hybridization results in an F_1 which is a partial or complete synthesis of an ancestral condition.

(e) This conception gives an explanation of the general presence of recessive units corresponding to the dominant units in each closely related form.

(f) If the change from the dominant to the recessive condition is a degenerative process which may be followed by complete disappearance of a unit, an explanation is found for the fact that Mendelian behavior is a function of nearly related forms but not of more distantly related ones.

GEORGE HARRISON SHULL
STATION FOR EXPERIMENTAL EVOLUTION,
COLD SPRING HARBOR, LONG ISLAND,
December, 1906

CURRENT NOTES ON METEOROLOGY AND CLIMATOLOGY

THE LOP-NOR DESERT

ELLSWORTH HUNTINGTON continues his papers on his recent explorations in Eastern Turkestan with a discussion of 'Lop-Nor—A Chinese Lake,' in the *Bulletin of the American Geographical Society* for February and March, 1907. Additional evidence is adduced regarding what seems to Huntington to be a progressive desiccation of the region within historical times. At Miran the ruins of an ancient Buddhist town, perhaps 1,500 years old, were discovered, covering an area of over five square miles. The town probably had a population of some thousands, but the "modern water supply is only sufficient to support seventy or eighty people." The saline water which the camels have to drink affects their flesh so markedly that the meat becomes 'corned' by reason of the salt accumulating in the animals' bodies from the water. The journey across the old lake bed was very tedious and difficult by reason of the irregularity of the large rock-salt blocks which cover the surface. Huntington remarks particularly upon the ability of his camel-man to endure hardship and fatigue with a minimum allowance of food and water. On one occasion the man traveled fifty miles in twenty hours without nourishment or water. This effect of a desert life in hardening man to the endurance of hunger, thirst and fatigue, as contrasted with the easier, softer life in more humid regions or in oases, has been commented on by other travelers, notably by Nachtigal some years ago. The history of Lop-Nor during the last 2,000 years seems to Huntington to show the following stages: First, a comparatively large lake, said to measure seventy-five miles each way. Next, during the early centuries of the Christian era, an increase in the recorded size of the lake, which can not have been due to diminished use of the rivers for irrigation, for the population at that time was larger than at present. Finally, in the last few hundred years there has been a decrease in the size of the lake and in the population about it. It may here be noted that not all

explorers of Central Asia are agreed as to the fact of climatic change. Thus Dr. Stein, the anthropologist, writing from Kiria to the *Geographical Journal* (January, 1907), reports concerning the desert east of Khotan that cultivation in the fertile Hanguya tract is steadily advancing towards areas previously abandoned to the desert, so that much of this desolate Tati is likely to be recovered by man from the desert at no distant time. Dr. Stein was much struck by the considerable extension of cultivated ground during the past six years. Extended areas lying waste or drift-covered in 1900-1, have again been brought under cultivation. The great advance in prosperity which is taking place in the western oasis of Chinese Turkestan seems to have had a marked effect in Khotan on the extent of the cultivated area and the numbers of the population.

FRANKLIN, THE KITE AND THE LIGHTNING ROD

'Did Benjamin Franklin fly his Electrical Kite before he invented the Lightning Rod' is the title of a paper read by Professor A. L. Rotch before the American Antiquarian Society in Worcester, Mass., October 24, 1906. Professor Rotch believes: (1) that the kite experiment was probably performed later than has been supposed; (2) that even before this experiment certain buildings in Philadelphia were provided with 'points,' probably as lightning conductors; (3) that prior to Franklin's first account of the kite experiment he had drawn up precise directions for placing lightning rods upon all kinds of buildings.

R. DEC. WARD

HARVARD UNIVERSITY

A MONUMENT TO LAMARCK

THE professors of the Muséum national d'histoire naturelle, Paris, have undertaken to erect a monument in the Jardin des Plantes to their illustrious predecessor, the philosopher and naturalist Lamarck. To this end they have secured subscriptions in Paris and have formed a committee to enlist the support of botanists and zoologists throughout the world.

The proposed monument, designed by M.

Fagel, gives a bronze bust of Lamarck, surmounting, after the fashion of recent French sculpture, a large granite pedestal with figures in relief. These portray the philosopher aged and blind, seated at the base of his monument, and close by, reading to him, his devoted daughter—a pathetic picture of Lamarck's last days when in poverty and in disfavor, on account of his evolutionary writings, he was living as a recluse in the ancient house of Buffon, near which, probably on the very spot which he crossed in his daily walk, the monument is to stand.

It is only within recent years that the position of Lamarck among the pioneers of evolution has come to be understood. Darwin himself was distinctly unjust in his treatment of him. But from the work of the modern paleontologist on the one hand and the experimentalist on the other, tribute is coming to be paid to Lamarck's wonderful insight, imperfect though the materials of his inductions were, into the processes and factors of organic evolution. The 'American school of evolutionists,' headed by Cope, Osborn, Hyatt, Ryder, Packard, has indeed touched so closely the lines of his philosophy that it has often merited the title of 'Neo-Lamarckian.' And it is to our countryman, Packard, that we are indebted for the only work upon the life and teachings of Lamarck which has hitherto appeared.

The present project in memory of Lamarck is one, in short, which may justly enlist the cooperation and support of the botanists and zoologists throughout the United States—to give by this means tangible recognition of his services to science. The American zoologists who have been designated to receive subscriptions in behalf of the Committee in Paris are Professors Alexander Agassiz, Henry Fairfield Osborn and Bashford Dean.

THE SEVENTH INTERNATIONAL ZOOLOGICAL CONGRESS

THE revised program of the Seventh International Zoological Congress, to be held at Boston, August 19-23, under the presidency of Mr. Alexander Agassiz, is as follows:

Monday, August 19.

9 A.M. Members of the congress will assemble informally at the Harvard Medical School. Registration.

12:30 P.M. Luncheon at the invitation of the Boston local committee.

2 P.M. First general meeting at the Harvard Medical School. Opening of the congress. Election of the vice-presidents and secretaries. Presentation of delegates. Arrangement of the sections. Addresses.

The International Commission on Zoological Nomenclature, Professor R. Blanchard, Paris, president, will hold its regular meetings during the sessions of the congress.

8:30 P.M. Reception.

Tuesday, August 20.

10 A.M. Meeting of sections in the Harvard Medical School.

1 P.M. Luncheon at the invitation of the Boston local committee.

3 P.M. Excursion.

Wednesday, August 21.

10 A.M. Meeting of sections in the Harvard Medical School.

1 P.M. Luncheon at the invitation of the Boston local committee.

2:30 P.M. Second general meeting at the Harvard Medical School. Business. Addresses.

8:30 P.M. Reception by Mr. Alexander Agassiz, Hotel Somerset, Commonwealth Avenue.

Thursday, August 22.

10 A.M. Meeting of sections at the Harvard Medical School.

1 P.M. Luncheon at the invitation of the Boston local committee.

3 P.M. Excursion to Wellesley as guests of Wellesley College.

Friday, August 23.

10 A.M. Meeting of sections at the Harvard Medical School.

1 P.M. Luncheon at the invitation of the Boston local committee.

2:30 P.M. Third general meeting. Business. Addresses. Close of the congress.

8:30 P.M. Subscription dinner.

Saturday, August 24—Harvard University Day.

10 A.M. Excursion to Harvard University, Cambridge. During the day the museums and other buildings of the university will be open to members of the congress.

1 P.M. Luncheon by invitation of the corporation of Harvard University.

Sunday, August 25—Woods Hole Day.

Morning. Members of the congress will leave the South Station, Boston, for Woods Hole, via New York, New Haven and Hartford Railroad. At Woods Hole the Station of the United States Bureau of Fisheries and the Marine Biological Laboratory will be visited.

1 P.M. Dinner at the invitation of the general committee.

4 P.M. Members will leave for New York via Fall River Line.

Monday, August 26—Columbia University Day.

Morning. Arrival in New York City.

12 M. Luncheon.

Evening. Reception and concert.

Tuesday, August 27—American Museum Day.

12 M. Luncheon.

Afternoon. Reception.

Evening. Smoker.

Wednesday, August 28.

Visit to the Marine Laboratory of the Brooklyn Institute of Arts and Sciences and to the Carnegie Station for Experimental Evolution at Cold Spring Harbor. Return to New York by boat or train, according to weather.

Thursday, August 29—New York Zoological Society Day.

Morning. Reception by the Zoological Society in the New York Aquarium.

Afternoon. Reception by the Zoological Society in the Zoological Park.

Evening. Reception in Columbia University Library.

Friday, August 30.

Hudson River by day. Excursion by steamer up the Hudson to West Point and Garrison as guests of Professor Henry Fairfield Osborn.

Saturday, August 31.

Visits to Yale University and to Princeton University.

Monday, September 2.

Morning. Departure from New York for Philadelphia.

Noon. Luncheon at the Academy of Natural Sciences, Philadelphia, followed by inspection of the library and museum.

3 P.M. Carriage drive to the Zoological Gardens and Fairmount Park, terminating in a supper at the Philadelphia Country Club.

Tuesday, September 3.

9 A.M. Visits to the American Philosophical Society, Independence Hall, Girard College and other places of interest.

Noon. Visit to the University of Pennsylvania, where luncheon will be served.

Afternoon. Departure for Washington.

Wednesday, September 4.

10 A.M. General meeting in the assembly hall of the Cosmos Club, Washington, at which addresses of welcome will be given by the secretary of the Smithsonian Institution, the president of the Carnegie Institution and the president of the Washington Academy of Sciences; and the details of the program for the Washington visit will be announced. This will be followed by a visit to the National Zoological Park, to the Congressional Library, the United States Department of Agriculture, the Hygienic Laboratory and other points of zoological interest.

Evening. Reception by the Cosmos Club.

Thursday, September 5.

A visit by boat on the Potomac River to Mt. Vernon, the home of George Washington and to the United States Navy Proving Station at Indian Head, with dinner at Marshall Hall.

Evening. Reception at the United States National Museum.

Friday, September 6.

Morning or afternoon. Return to New York.

On September 7, there will be an excursion to Niagara Falls and across Lake Ontario to Toronto. In case at least fifty members agree to take part in an excursion to Bermuda, one will be arranged on September 11 or 14.

SCIENTIFIC NOTES AND NEWS

MR. EDWARD B. MOORE, assistant commissioner of patents, has been appointed commissioner to succeed Mr. Frederick I. Allen, who has resigned.

PROFESSOR FRANCIS HUMPHREYS STORER, S.B. (Harvard, 1855), since 1870 professor of agricultural chemistry at Harvard University and at the same time dean of Bussey Institution, has resigned and has been appointed professor emeritus from September 1.

DR. W. L. RICHARDSON has resigned the chair of obstetrics and the deanship of the Harvard Medical School. Dr. Richardson graduated from Harvard College in 1864 and from the medical school in 1867.

PROFESSOR AIMÉ WITZ, of Lille, has been elected a corresponding member in the Paris Academy of Sciences in the section of physics, in the room of the late Professor Boltzmann.

M. DARBOUX, permanent secretary of the Paris Academy of Sciences and professor of

mathematics in the University of Paris, has been named a member of the national bureau of weights and measures in the room of the late M. Berthelot.

MAJOR JAMES CARROLL, U.S.A., will receive the degree of doctor of laws from the University of Maryland at its centennial celebration to be held from May 30 to June 2.

NEW YORK UNIVERSITY has conferred the degree of doctor of laws on Dr. Joseph D. Bryant, professor of surgery in the institution and president of the American Medical Association.

DR. J. PLAYFAIR McMURRICH, professor of anatomy at the University of Michigan, has been elected a corresponding member of the London Zoological Society.

PROFESSOR ERNST VON LEYDEN, the eminent surgeon of Berlin, has been made a privy-councillor, with the title of excellency.

MR. F. E. BEDDARD, F.R.S., has been appointed an honorary member of the New Zealand Institute.

PROFESSOR JOHN ADAMS, who holds the chair of education in the University of London, and Dr. J. M. E. McTaggart, lecturer in moral science, Trinity College, Cambridge, will take part in the work of the summer school of the University of California, which opens on June 24.

DR. WILLIAM HALLOCK, dean of the faculty of pure science, has been elected president of the Columbia chapter of the Society of Sigma Xi.

DURING the college year 1906-7 the Sigma Xi Society of the Ohio State University has offered the following course of open scientific lectures:

November 27—'The Cellular Basis of Inheritance and Evolution,' Dr. E. G. Conklin, University of Pennsylvania.

January 10—'The Source and Utilization of Our Fuel Supply,' Professor E. E. Sommermeier, Ohio State University.

March 14—'Modern Methods in Water Purification,' Mr. John H. Gregory, Engineer in charge of Improved Water and Sewage Works, Columbus, Ohio.

April 18—'The Coal Tar Products and their

Uses in the Arts,' Dr. William McPherson, Ohio State University.

MR. A. ROLLAND RAINY, M.P., delivered an address on 'The Necessity for a Minister of Public Health' before the New Reform Club, London, on May 10, when the chair was taken by Sir W. J. Collins, M.P.

PROFESSOR WILLIAM WRIGHT has delivered three lectures on the 'Prehistoric and Early Historic Inhabitants of England' at the Royal College of Surgeons, London.

PROFESSOR DAVID P. TODD, of Amherst College, sailed on the *Panama* on May 11 for Colon, Panama, Callao, Peru and Iquique, Chile, in charge of the Lowell Astronomical Exhibit to the Andes sent out by Professor Percival Lowell, of Boston. Mr. E. C. Slipper is photographer, Mr. A. G. Ilse of Alvan Clark & Sons the instrument maker, and Mr. R. D. Eaglesfield, mechanic. The party will observe the opposition of Mars with the eighteen-inch telescope of Amherst College Observatory, and the annular eclipse of the sun, July 10, for Professor Newcomb.

PROFESSOR GEORGE P. MERRILL, head curator of geology at the U. S. National Museum, has just left Washington upon an investigating tour to Canyon Diablo, near Flagstaff, Arizona. He is sent out by the Smithsonian Institution to study the geologic origin of a remarkable crater-form depression at the Canyon, in connection with which two theories have been held, one ascribing its origin to a prehistoric volcanic explosion, the other holding that it is due to the impact of a gigantic mass of meteoric iron. The object of Dr. Merrill's trip is to determine if possible which of these theories is correct, or whether its origin must be accounted for in some other manner. While on the trip, Dr. Merrill will visit the so-called petrified or fossil forest near Holbrook, Arizona, to collect for the National Museum specimens for scientific work.

THE St. Louis Medical Society commemorated on April 27 the twenty-fifth anniversary of the death of Dr. John T. Hogden, the eminent surgeon.

DR. RUDOLF ADERHOLZ, director of the Biological Department of the Agricultural and

Forestry Institute of Berlin, has died at the age of forty-two years.

THE deaths are announced of M. Paul Porrier, professor of anatomy in the University of Paris; of Dr. Oscar Doebner, professor of chemistry at Halle, and of Mr. George E. Davis, founder and editor of the *Chemical Trade Journal*.

THE senate of the state of Pennsylvania has unanimously passed a bill appropriating \$350,000 to the American Philosophical Society to provide a fitting memorial to Benjamin Franklin.

THE collection of geological books and pamphlets which was the property of the late Dr. Carl Rominger has been donated to the Russell Library of the University of Michigan.

PROFESSOR THEODORE D. A. COCKERELL, of Boulder, Colorado, recently transmitted to Dr. Arthur Hollick, of the New York Botanical Garden, a collection of undescribed fossil plant remains from the Tertiary beds of Florissant in that state.

THE Pathological Society of Philadelphia celebrated its semi-centennial on May 9 and 10. On the first day there was an exhibition in the Mütter Museum of the College of Physicians. On May 10 there was a luncheon and a dinner and the following addresses were made: 'The Rôle of Protozoa in Pathology,' by Dr. Frederick G. Novy, of the University of Michigan; 'The Dynamic Point of View in Pathology,' by Professor Alonzo E. Taylor, University of California; 'The Newer Pathology,' by Dr. Simon Flexner, Rockefeller Institute, and 'Pathology and Practise,' by Dr. William Osler, Oxford University, England.

At a meeting held recently under the presidency of Professor Golgi it was decided that an Italian Neurological Society should be established. Professor Bianchi was elected president, Professors Morelli and Mingazzini, vice-presidents, and Professor Tanzi, general secretary. The first meeting has been fixed for October 16, 17 and 18 of the present year at Naples.

The British Medical Journal states that the tenth congress of Polish physicians and men of science will be held this year at Lemberg,

some time between June 16 and July 24. Connected with it there will be a scientific and medical exposition divided into sections as follows: I. Natural Science and Medicine, subdivided into the following groups: (a) scientific and medical; (b) balneological; (c) pharmaceutical; (d) industrial chemistry; (e) medical instruments and apparatus. II. Hygiene, subdivided into groups as follows: (a) hygiene of nutrition; (b) personal hygiene; (c) hospital administration; (d) training of youth; (e) hygiene of factories and workshops; (f) hygiene of the dwelling; (g) hygiene of clothes; (h) infectious diseases and their prevention; (i) hygiene of childhood; (j) public health. Foreign institutes and firms may take part in the scientific section of the exposition, but may only show such objects as will not interfere with Polish industries. Communications should be addressed to the director of the exposition, Dr. Kalikst Kryzanowski, Lemberg.

THE bill to prohibit vivisection in Pennsylvania has been dropped from the calendar in the legislature. This action followed an address in opposition to the measure made to fifty members of the house by Dr. S. Weir Mitchell of Philadelphia.

UNDER the direction of the College of Agriculture of Ohio State University a special train was recently run through several parts of the state bearing certain exhibits of interest to agriculturists. Brief addresses were made at the various towns passed through by instructors from the university.

THAT part of the fuel testing equipment being operated by the Geological Survey which relates to the investigation of fuels under the boilers and the gas producers, and the briquetting investigations, is now being transferred to Norfolk, Va., where during the Jamestown Exposition these will be used in testing coals, lignites and peats of the Atlantic and Gulf seaboard; and during this time will be tested specially the fuels available for the use of the navy, testing the briquetted coals as compared with the run-of-mine coals from the same mines. The other part of the fuel testing plant equipment which relates to

the coking of coals, including the coal washing investigations, is now being transferred to Denver, Colo., where investigations will be conducted during the remainder of the present year to determine the coking qualities of the different coals in the Rocky Mountain and other western states.

DR. WILLIS L. MOORE, chief of the Weather Bureau, writes in his annual report for the year ending June 30, 1906, in regard to the Mount Weather Research Observatory as follows: "The meteorological work of a first-order station has been maintained throughout the year, and telegraphic reports were transmitted to the Central Office in Washington daily at 8 A.M. and 8 P.M. Work on the physical laboratory was resumed in July and satisfactory progress was made during the summer and fall of 1905. The building will probably be completed early in 1907. In the preparation for kite and balloon work a number of important instruments have been installed and made ready for systematic work. Among these may be mentioned: (1) The electrolyzer, for the manufacture of the hydrogen gas employed in the kite balloon and the small rubber balloons; (2) the apparatus for the manufacture of liquid air, employed in testing thermometers at very low temperatures; (3) the apparatus used in testing the barometers, thermometers and meteorographs employed in connection with the kites and balloons. A medium-sized power kite-reel was installed in the revolving kite-house early in the year, and experimental kite-flying was begun in September of 1905. During the year the stock of meteorographs, of kites and of kite wire was materially increased; the instrumental equipment now includes eight different styles of kite-balloon meteorographs, comprising English, German and French designs, in addition to the Marvin type heretofore used in the kite work of the bureau, and the new Fergusson pattern used at the Blue Hill Observatory. In April, 1906, systematic cooperation was begun in connection with the work of the International Committee for Scientific Ballooning by flying kites on prearranged term days, and this work is being regularly main-

tained. The interior finishings of the magnetic observatory buildings, the erection of the piers and the installation of the magnetic instruments were completed during the year. The instruments for absolute observations, except the declinometer and some auxiliary apparatus, were received and set up before January 1, 1906. The remaining absolute instruments were received and put in place by the end of May, and routine observations were established at the end of the fiscal year. The Eschenhagen magnetographs were set up in the basement of the absolute observatory in December, 1905, and have given a satisfactory record of the magnetic elements since that time. The Wild magnetographs were received and installed by the first of June, and were being adjusted by the end of the fiscal year. A gas plant for heating and illuminating the magnetic observatories was put in during the winter and has given satisfactory service since then. Plans were prepared for an additional office and dwelling for the director of upper-air research, and work on this building was begun July 1, 1906."

UNIVERSITY AND EDUCATIONAL NEWS

ANNOUNCEMENT is made that Princeton University has received from donors whose names are for the present withheld a gift of \$1,200,000, for the erection and endowment of two scientific buildings—one for physical science and one for biology and geology. In each case the building will be erected at a cost of \$400,000, and \$200,000 is provided for equipment and maintenance.

Mr. EDWARD W. CURRIER, an alumnus of Amherst College of the class of 1865, has bequeathed to the institution a large sum, said to be \$500,000. As has been already noted here, by Mr. Currier's death two legacies are released—one of \$180,000 to Williams College and one of \$100,000 to Yale University.

BARNARD COLLEGE, Columbia University, has been made the residuary legatee of the estate of Miss Emily O. Gibbs. It is estimated that the college may receive \$750,000.

THE University of Minnesota received at the recent session of the legislature a con-

siderable increase to be used for salaries. Previously the maximum salary was \$2,700 for heads of departments. These have now been increased to \$3,500, and other appointments in proportion. In addition, provision has been made for twenty-eight new appointments in the university. Several of these will be in the department of medicine, including three in anatomy, gross and microscopic, and one each in physiology, pathology and pharmacology.

THE Massachusetts Legislature has rejected the bill taxing residences occupied by officers of the colleges and universities of the state. The bill was passed in the senate, but defeated in the house by a vote of 142 to 14.

THE College of the City of New York celebrated the sixtieth anniversary of its foundation on May 7 by taking possession of its beautiful new buildings on Washington Heights. The ceremonies were first held in the chapel on the top floor of the old college building at Lexington Avenue and 23d St. Addresses were made by President Finley, Professor Alfred G. Compton, of the department of physics; Mr. Patrick F. McGowan, president of the Board of Aldermen; Mr. Richard Watson Gilder, of New York City, and Mr. Leslie M. Shaw. Further exercises were held in the Townsend-Harris Hall in the new buildings.

THE University of Geneva will celebrate with appropriate ceremonies the three hundred and fiftieth anniversary of its foundation, which falls in 1909. A committee has been appointed to arrange for the celebration to which representatives of foreign universities will be invited.

DR. WILLIAM JEWETT TUCKER has, owing to ill-health, resigned the presidency of Dartmouth College.

AT Harvard University, Dr. George Washington Pierce has been promoted to a professorship of physics.

DR. PHILIPP LENARD, of Kiel, has accepted the chair of physics at Heidelberg, where a new physical laboratory will be built for him.